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(54) Title: MATERIALS AND METHODS FOR THE MODIFICATION OF PLANT CELL WALL POLYSACCHARIDES

(57) Abstract

Novel isolated polynucleotides and polypeptides associated with the synthesis of plant cell wall polysaccharides are provided, together with genetic constructs comprising such sequences. Methods for using such constructs for the modulation of polysaccharide content in plants are also disclosed, together with transgenic plants comprising such constructs.

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MATERIALS AND METHODS FOR THE MODIFICATION OF PLANT CELL WALL POLYSACCHARIDES

Technical Field of the Invention

This invention relates to the field of modification of cell wall polysaccharide content and composition in plants. More particularly, this invention relates to enzymes involved in the synthesis of plant cell wall polysaccharides and nucleotide sequences encoding such enzymes.

Background of the Invention

Plant cells are characterised by having a rigid cell wall. These cell walls are comprised primarily of polymers of simple sugar monomers linked in a variety of linear or branched polymers known as polysaccharides. The most abundant simple sugar monomer is glucose, and the most abundant polymer is cellulose. Cellulose is a linear, unbranched polymer, comprised of β-1,4 linked glucose monomers. Other polysaccharides found in plant cell walls include hemicellulose, which is a group of polysaccharides comprised of β-1,4 linked glucose monomers having side chains which may include sugars other than glucose. These side chains frequently include xylose, fucose, arabinose, and galactose. Pectins are another type of polysaccharide found in plant cell walls. Pectins are acidic polysaccharides, which are generally comprised primarily of galacturonic acid and rhamnose sugar monomers. Amylose is an additional common plant polysaccharide which is not usually found as a major component of cell walls. It acts primarily as a storage material for glucose, rather than as a structural polymer. However, because amylose is comprised primarily of α-1,4-linked glucose monomers, it is considered to be a related polymer from a biochemical and physiological perspective.

Plant polysaccharides have many uses. Certain plastics, such as cellulose acetate, and synthetic textiles, such as rayon, are made from cellulose. In addition, some biodegradable plastics and digestible medicine capsules, as well as medical fillers and fiber additives for food, can be made from plant polysaccharides.

In foodstuffs, polysaccharides have a profound impact on food quality. Cell walls contribute to crispness in carrots, while degradation of cell walls is required for softening of fruits, such as peaches and tomatoes. In maize, increased amylose is desirable for cattle feed, but not for human consumption, and increased cell wall strength reduces digestibility. In fiber crops, such as timber, cellulose is the primary polymer of interest. Wood density, a fundamental measure of structural timber quality, is essentially a measure of cellulose content. In the paper pulping industry, efficiency is measured in terms of yield of cellulose. Clearly, the ability to increase cellulose content in timber is an important economic goal.

The sugars which make up plant cell wall polysaccharides are produced in the photosynthetic organs of plants. The sugars so produced are commonly converted into sucrose, a disaccharide consisting of glucose and fructose. Sucrose is transported throughout the plant, to wherever sugar monomers are called for. Thus, the photosynthetic organs are often referred to as a source, while tissues requiring large amounts of sugar monomers are referred to as a sink. Actively growing regions of the plant are generally sink tissues, as new cell wall synthesis requires large amounts of sugar monomers.

When the transported sucrose arrives at the sink destination, it must be converted into whichever kind of sugar monomer is required. The sugar monomers which make up plant cell walls are primarily 5- or 6-carbon sugars. Different sugars are generally distinguished by stereospecific orientation of hydroxyl groups. Plants contain a variety of enzymes, such as isomerases or epimerases, which can rapidly change the orientation of these hydroxyls. In addition, there are a number of enzymes which can add or remove a single carbon from a sugar monomer. The result is a single pool of sugar monomers which the plant can freely inter-convert into whichever kind is needed for cell wall synthesis.

Plant polysaccharides are thus biochemically and physiologically inter-related. All polymers compete for the same pool of sugar monomers, and all sugar monomers can be freely interconverted to other types. Degradation of any one polymer will provide building material for any other. Attempts to engineer changes in one polymer may therefore have pleiotropic effects on other polymers.

The rate of cell wall synthesis is dependent on both the availability of sugar monomers to serve as building blocks for the polymers of the wall, and the enzymes which polymerise those building blocks into polymers. Enzymes which are directly responsible for the

synthesis of the major cell wall polymers, such as cellulose, hemicellulose and pectin, may have a profound impact on the rate of cell wall synthesis. Source-sink relations may play an important role in limiting cell wall synthesis, if the availability of substrates becomes limiting. Polymer degrading enzymes may liberate sugar monomers from unnecessary polymers for use in building new, desired polymers. Enzymes which can isomerise sugars from one form into another can convert the sugars into whichever kind is needed. Each of the different types of cell wall polysaccharides effectively competes for the same pool of sugar monomers, and each represents a potential source of monomers for any of the other polymers.

The final committed steps in cellulose biosynthesis involve a relatively small number of enzymes. Cellulose synthase (CEL) is believed to function as part of a large, membrane-bound complex which also includes sucrose synthase (SUS: Amor et al., *Proc. Natl. Acad. Sci USA* 92:9353-9357, 1995) and annexin (ANX: Clark and Roux, *Plant Phys.* 109:1133-1139, 1995). This enzyme complex polymerises activated glucose into the cellulose polymer. The glucose is activated by UDP-glucose pyrophosphorylase (UGP), also known as UTP-glucose-1-phosphate uridylyltransferase. These enzymes are believed to be sufficient for the biosynthesis of cellulose from glucose. Other than these steps, the availability of glucose appears to be the most significant rate-limiting step in cellulose biosynthesis.

Glucose is primarily stored in most plants as amylose. Plants routinely store amylose and degrade it to free up the glucose monomers, as needed. By inhibiting the efficiency of glucose storage, or by increasing the liberation of glucose from amylose, the availability of glucose monomers for cellulose biosynthesis can be increased. The rate-limiting enzyme in the storage of glucose as amylose is ADP-glucose pyrophosphorylase (AGP), also known as ATP-glucose-1-phosphate adenylyltransferase (Iglesias et al., *J. Biol. Chem.* 268:1081-1086, 1993). Conversely, the enzyme most responsible for liberating glucose from amylose is amylase (AMA: Kawagoe and Delmer, *Genetic Engineering* 19:63-87, 1997).

These enzymes clearly will be important in the engineering of economically useful changes in cellulose biosynthesis. In addition, there are many other enzymes which may be useful in influencing plant cell wall polysaccharide biosynthesis. Other enzymes likely to be involved in cellulose biosynthesis include 1,4-β-cellobiohydrolase, β-glucosidase, calnexin, cellobiose epimerase, cellobiose phosphorylase, cellulase A, dextransucrase, invertase, phosphodiesterase, phosphoglucomutase, sucrose phosphate synthase, sucrose phosphorylase,

UDP-glucose 4-epimerase and UDP-glucose dehydrogenase. Enzymes believed to be involved in hemicellulose biosynthesis include β-glucanase, arabinan synthase, GDP-fucose pyrophosphorylase, GDP-mannose pyrophosphorylase, 1,3 and 1,4-β-glucanases, 1,3 and 1,4-β-glucosidases, mannose-6-phosphate isomerase, *n*DP-hexose pyrophosphorylase, xyloglucan endotransglycosylase and xyloglucan synthase. Enzymes likely to be involved in pectin biosynthesis include α-galactosidase, β-glucuronidase, exopolygalacturonase, glucuronosyl-transferase, pectin methyl-esterase, polygalacturonase and UDP-hexose-1-phosphate uridylyltransferase. Enzymes believed to be involved in amylose biosynthesis include α–glucosidase, amylopectin 6-glucanohydrolase, amylopectin-branching glycosyltransferase, β–amylase, branching enzyme, inulosucrase, isoamylase, isomaltase, levansucrase, starch phosphorylase and starch synthase. Enzymes likely to be involved in the interconversion of 5-carbon sugars include 2-dehydro-3-deoxy-gluconokinase, aldehyde reductase, arabinose isomerase, D-arabinitol dehydrogenase, D-xylulose reductase, endo-1,4-β-xylanase, exo-1,4-β-xylanase, L-arabinose isomerase, L-ribulokinase, L-xylulokinase, phospho-ribulokinase, ribose 5-phosphate isomerase, ribulose-phosphate-3-epimerase, ribulose-phosphate-4-epimerase, transaldolase, transketolase, xylose isomerase and xylulokinase. Enzymes likely to be involved in interconversion of 6-carbon sugars include 6-phospho-fructo-1-kinase, 6-phospho-fructo-2-kinase, trehalose phosphate synthase, aldolase, aldose 1-epimerase, D-fructokinase, D-galactokinase, fructose 1,6-diphosphatase, gluconolactonase, glucose 1-phosphatase, glucose 6-phosphatase, glucose 6-phosphate dehydrogenase, glucose-phosphate isomerase, hexokinase, phosphoglucomutase, trehalase, trehalose phosphatase and UDP-galactose dehydrogenase.

While DNA sequences encoding some of the enzymes involved in the biosynthetic pathways of plant cell wall polysaccharides have been isolated for certain species of plants, genes encoding many of the enzymes in a wide range of plant species have not yet been identified. Thus, there remains a need in the art for materials useful in the modification of cell wall polysaccharide content and composition in plants.

Summary of the Invention

Briefly, the present invention provides polynucleotides isolated from eucalyptus and pine which encode enzymes involved in the synthesis of cell wall polysaccharides. Genetic constructs including such sequences and methods for the use of such constructs are also provided, together with transgenic plants having altered cell wall polysaccharide content and composition.

In one embodiment, the isolated polynucleotides comprise a nucleotide sequence selected from the group consisting of: (a) sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; (b) complements of the sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; (c) reverse complements of the sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; (d) reverse sequences of the sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; and (e) sequences having either 40%, 60%, 75% or 90% identical nucleotides, as defined herein, to a sequence of (a) – (d).

In a further aspect, isolated polypeptides encoded by a polynucleotide of the present invention are provided. In one embodiment, such polypeptides comprise an amino acid sequence selected from the group consisting of SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148, and variants thereof.

In another aspect, the invention provides genetic constructs comprising a polynucleotide of the present invention, either alone, in combination with one or more of the inventive polynucleotide sequences, or in combination with one or more known polynucleotides, together with transgenic cells comprising such constructs.

In a related aspect, the present invention provides genetic constructs comprising, in the 5'-3' direction, a gene promoter sequence; an open reading frame coding for at least a functional portion of an enzyme encoded by a polynucleotide of the present invention or a variant thereof; and a gene termination sequence. The open reading frame may be orientated in either a sense or antisense direction. Genetic constructs comprising a non-coding region of a gene coding for an enzyme encoded by the above polynucleotides or a nucleotide sequence complementary to a non-coding region, together with a gene promoter sequence and a gene termination sequence, are also provided. Preferably, the gene promoter and termination

sequences are functional in a host plant. Most preferably, the gene promoter and termination sequences are those of the original enzyme genes but others generally used in the art, such as the Cauliflower Mosaic Virus (CMV) promoter, with or without enhancers such as the Kozak sequence or Omega enhancer, and *Agrobacterium tumefaciens* nopalin synthase terminator may be usefully employed in the present invention. Tissue-specific promoters may be employed in order to target expression to one or more desired tissues. In a preferred embodiment, the gene promoter sequence provides for transcription in xylem. The genetic construct may further include a marker for the identification of transformed cells.

In a further aspect, transgenic plant cells comprising the genetic constructs of the present invention are provided, together with plants comprising such transgenic cells, and fruits, seeds and other products, derivatives, or progeny of such forestry plants. Propagules of the transgenic plants transformed with the inventive polynucleotides are also included in the present invention. As used herein, the word "propagule" means any part of a plant that may be used in reproduction or propagation, sexual or asexual, including cuttings.

Plant varieties, particularly registrable plant varieties according to Plant Breeders' Rights, may be excluded from the present invention. A plant need not be considered a "plant variety" simply because it contains stably within its genome a transgene, introduced into a cell of the plant or an ancestor thereof.

In yet another aspect, methods for modulating the polysaccharide content and composition of an organism, such as a plant, are provided, such methods including stably incorporating into the genome of the plant a genetic construct of the present invention. In a preferred embodiment, the target plant is a woody plant, preferably selected from the group consisting of eucalyptus, pine, acacia, poplar, sweetgum, teak and mahogany species, more preferably from the group consisting of pine and eucalyptus species, and most preferably from the group consisting of *Eucalyptus grandis* and *Pinus radiata*. In a related aspect, a method for producing a plant having modified cellulose content is provided, the method comprising transforming a plant cell with a genetic construct of the present invention to provide a transgenic cell and cultivating the transgenic cell under conditions conducive to regeneration and mature plant growth.

In yet a further aspect, the present invention provides methods for modifying the activity of a polypeptide in a plant, comprising stably incorporating into the genome of the

plant a genetic construct of the present invention. In a preferred embodiment, the target plant is a woody plant, preferably selected from the group consisting of eucalyptus, pine, acacia, poplar, sweetgum, teak and mahogany species, more preferably from the group consisting of pine and eucalyptus species, and most preferably from the group consisting of *Eucalyptus grandis* and *Pinus radiata*.

The above-mentioned and additional features of the present invention and the manner of obtaining them will become apparent, and the invention will be best understood by reference to the following more detailed description. All references disclosed herein are hereby incorporated by reference in their entirety as if each was incorporated individually.

Brief Description of the Figures

Fig. 1 illustrates the level of native CEL enzyme activity in positive control mung bean (*V. radiata*) plants.

Fig. 2 illustrates the level of CEL enzyme activity in mammalian 293T cells transfected with *E. grandis* CEL as compared to that in non-transfected 293T cells.

Detailed Description

As outlined above, cellulose is formed by polymerization of glucose into a linear, unbranched, polymer comprised of β-1,4 linked glucose monomers (Kawagoe and Delmer, *Genetic Engineering,* 19:63-87, 1997). Cellulose is the most important plant cell wall polysaccharide from both a structural, as well as industrial, perspective. Other polysaccharides are essential for healthy cell walls, as well as for many alternative industrial uses.

Glucose monomers are most commonly stored in the plant in the form of amylose by the action of several enzymes, with the rate limiting step for storage being catalysed by AGP (Iglesias et al., *J. Biol. Chem.* 268:1081-1086). Glucose monomers are freed from this storage polymer by the action of the enzyme AMA. The free monomers are activated by the action of the enzyme UGP, and polymerised into cellulose macro-crystalline structures by the action of the cellulose synthase enzyme complex. Pure CEL enzyme has been shown to form β-1,4 glucose linkages *in vitro*, but has not been shown to be sufficient for polymerization of the

large polymers which are fundamental to the structure of plant cell walls. The holoenzyme complex appears to be necessary for this latter function. The holoenzyme is believed to be comprised of the CEL enzyme in combination with the SUS enzyme and ANX, the whole complex being integrated into the plasma membrane and forming a "rosette" structure as seen in electron micrographs of plant cell membranes (Arioli et al., *Science* 279:717-720, 1998).

Because cellulose synthesis can represent such a large sink for sugar monomers in the cell, changes in the rate of cellulose synthesis can have a profound influence on the synthesis of other plant polysaccharides. Conversely, changes in the rates of synthesis of other plant polysaccharides can have a profound influence on the pool of sugars available for synthesis of cellulose. Hence, changes in the synthesis of any single polymer may affect both the content and composition of plant cell wall polysaccharides, and polysaccharides in general.

Quantitative and qualitative modifications in plant polysaccharide content are known to be induced by external factors such as light stimulation, low calcium levels, and mechanical stress. Synthesis of cell wall polysaccharides can also be induced by infection with pathogens.

Using the methods and materials of the present invention, the polysaccharide content of a plant may be increased or reduced, by incorporating additional copies of genes encoding enzymes involved in the synthesis of cell wall polysaccharides into the genome of the target plant. Similarly, an increase or decrease in polysaccharide content may be obtained by transforming the target plant with antisense copies of such genes. In addition, the number of copies of genes encoding for different enzymes in the biosynthetic pathway of cell wall polysaccharides can be manipulated to modify the relative amount of each monosaccharide synthesized, thereby leading to the formation of cell walls having altered composition. The alteration of polysaccharide composition would be advantageous, for example, in tree processing for paper.

The polynucleotides of the present invention were isolated from forestry plant sources, namely from *Eucalyptus grandis* and *Pinus radiata*, but they may alternatively be synthesized using conventional synthesis techniques. Specifically, isolated polynucleotides of the present invention include polynucleotides comprising a sequence selected from the group consisting of sequences identified as SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; complements of the sequences identified as SEQ ID NOS: 1-29, 57-80, 105,

107, 109-113, 119-129, 139-143 and 149-908; reverse complements of the sequences identified as SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; at least a specified number of contiguous residues (x-mers) of any of the above-mentioned polynucleotides; extended sequences corresponding to any of the above polynucleotides; antisense sequences corresponding to any of the above polynucleotides; and variants of any of the above polynucleotides, as that term is described in this specification.

In another embodiment, the present invention provides isolated polypeptides encoded by the DNA sequences of SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908;. The predicted amino acid sequences encoded by SEQ ID NOS: 1-22, 24-28, 57-80, 105, 107, 109-113 and 119-143, based on the best available information at the time of filing this application, are provided in SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148, respectively. The present invention also encompasses polynucleotides that differ from the disclosed sequences but which, due to the degeneracy of the genetic code, encode a polypeptide which is the same as that encoded by a polypeptide of the present invention. Such polynucleotides are said to be "degeneratively equivalent" to a polynucleotide sequence disclosed herein.

The polynucleotides and polypeptides of the present invention were putatively identified by DNA and polypeptide similarity searches. In the attached Sequence Listing SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908 are polynucleotide sequences, and SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148 are polypeptide sequences. The polynucleotides and polypeptides of the present invention, have demonstrated similarity to enzymes that are known to be involved in the synthesis of cell wall polysaccharides. The putative identity of each of the inventive polynucleotides is shown below in Table 1.

TABLE 1

DNA SEQ ID NO:	PROTEIN SEQ ID NO:	IDENTITY
1	30	AGP
2	31	AGP
3	32	AGP
4	33	AMA

DNA SEQ ID NO:	PROTEIN SEQ ID NO:	IDENTITY
5	34	AMA
6	35	AMA
7	36	CEL
8	37	CEL
9	38	CEL
10	39	CEL
11	40	CEL
12	41	CEL
13	42	CEL
14	43	CEL
15	44	SUS
16	45	SUS
17	46	SUS
18	47	SUS
19	48	SUS
20	49	UGP
21	50	UGP
22	51	UGP
23	-	UGP
24	52	ANX
25	53	ANX
26	54	ANX
27	55	ANX
28	56	ANX
29	-	ANX
57	81	AMA
58	82	AMA
59	83	AGP
60	84	AGP
61	85	AGP
62	86	AGP
63	87	AGP
64	88	AGP
65	89	AGP
66	90	CEL
67	91	CEL
68	92	CEL
69	93	CEL
70	94	CEL
71	95	SUS
72	96	SUS
73	97	SUS
74	98	SUS
75	99	SUS
76	100	SUS
77	101	SUS
78	102	SUS
79	103	UGP
80	104	UGP

DNA SEQ ID NO:	PROTEIN SEQ ID NO:	IDENTITY
105	106	SUS
107	108	CEL
109	114	ANX
110	115	ANX
111	116	ANX
112	117	ANX
113	118	ANX
119	129	CEL
120	130	CEL
121	131	CEL
122	132	CEL
123	133	CEL
124	134	CEL
125	135	CEL
126	136	CEL
127	137	CEL
128	138	CEL
135	144	SUS
140	145	α-amylase
141	146	CEL
142	147	AGP (3' end of SEQ ID NO: 62)
143	148	SUS (3' of SEQ ID NO: 74)
149-185	-	1,3-β-D-Glucanase
186	-	1,4-β-Cellobiohydrolase
187-196	-	α,α-trehalose phosphate synthase
197-204	-	α-glucosidase
205-250	-	aldolase
251	-	Amylopectin 6-glucanohydrolase
252-262	-	β-amylase
263	-	β-glucosidase
264-272	-	Branching enzyme
273-318	-	D-fructokinase
319-354	-	D-xylulose reductase
355-365	-	Endo-1,3-1,4-β-glucanase
366-371	-	Glucan exo-1,3-β-glucosidase
372-377	-	Glucose 6-phosphate dehydrogenase
378-381	-	Glucose phosphate isomerase
382-389	-	Isoamylase
390-393	-	L-ribulokinase
394-398	-	Mannitol-1-phosphate 5-dehydrogenase
399-478	-	Pectin methyl-esterase
479-506	-	Phosphoglucomutase
507-508	-	Phospho-ribulokinase
509-521	-	Ribulose-phosphate-3-epimerase
522-530	-	Starch phosphorylase
531-551	-	Sucrose phosphate synthase
552-555	-	SUS
556-586	-	Transketolase
587-591	-	Trehalase

DNA SEQ ID NO:	PROTEIN SEQ ID NO:	IDENTITY
592-620	-	UDP-glucose 4-epimerase
621-902	-	Xyloglucan endotransglycosylase
903-908	-	Xylose isomerase

The term "polynucleotide(s)," as used herein, means a single or double-stranded polymer of deoxyribonucleotide or ribonucleotide bases and includes DNA and corresponding RNA molecules, including HnRNA and mRNA molecules, both sense and anti-sense strands, and comprehends cDNA, genomic DNA and recombinant DNA, as well as wholly or partially synthesized polynucleotides. An HnRNA molecule contains introns and corresponds to a DNA molecule in a generally one-to-one manner. An mRNA molecule corresponds to an HnRNA and DNA molecule from which the introns have been excised. A polynucleotide may consist of an entire gene, or any portion thereof. Operable anti-sense polynucleotides may comprise a fragment of the corresponding polynucleotide, and the definition of "polynucleotide" therefore includes all such operable anti-sense fragments.

The term "polypeptide", as used herein, encompasses amino acid chains of any length including full length proteins, wherein amino acid residues are linked by covalent peptide bonds. Polypeptides of the present invention may be naturally purified products, or may be produced partially or wholly using recombinant techniques.

The definition of the terms "complement", "reverse complement" and "reverse sequence", as used herein, is best illustrated by the following example. For the sequence 5' AGGACC 3', the complement, reverse complement and reverse sequence are as follows:

complement	3' TCCTGG 5'
reverse complement	3' GGTCCT 5'
reverse sequence	5' CCAGGA 3'.

As used herein, the term "variant" covers any sequence which has at least about 40%, more preferably at least about 60%, more preferably yet at least about 75% and most preferably at least about 90% identical residues (either nucleotides or amino acids) to a sequence of the present invention. The percentage of identical residues is determined by aligning the two sequences to be compared, determining the number of identical residues in

the aligned portion, dividing that number by the total length of the inventive, or queried, sequence and multiplying the result by 100.

Polynucleotide or polypeptide sequences may be aligned, and percentage of identical nucleotides in a specified region may be determined against another polynucleotide, using computer algorithms that are publicly available. Two exemplary algorithms for aligning and identifying the similarity of polynucleotide sequences are the BLASTN and FASTA algorithms. The similarity of polypeptide sequences may be examined using the BLASTP algorithm. Both the BLASTN and BLASTP software are available on the NCBI anonymous FTP server (ftp://ncbi.nlm.nih.gov) under /blast/executables/. The BLASTN algorithm Version 2.0.6 [Sept-16-1998], set to the default parameters described in the documentation and distributed with the algorithm, is preferred for use in the determination of variants according to the present invention. The use of the BLAST family of algorithms, including BLASTN and BLASTP, is described at NCBI's Internet website at the URL http://www.ncbi.nlm.nih.gov/BLAST/newblast.html and in the publication of Altschul, Stephen F, et al., "Gapped BLAST and PSI-BLAST: a new generation of protein database search programs," *Nucleic Acids Res.* 25:3389-3402, 1997. The computer algorithm FASTA is available on the Internet at the ftp site ftp://ftp.virginia.edu/pub/fasta/. Version 2.04, [February 1996], set to the default parameters described in the documentation and distributed with the algorithm, is preferred for use in the determination of variants according to the present invention. The use of the FASTA algorithm is described in Pearson WR and Lipman DJ, "Improved Tools for Biological Sequence Analysis," *Proc. Natl. Acad. Sci. USA* 85:2444-2448, 1988; and Pearson WR, "Rapid and Sensitive Sequence Comparison with FASTP and FASTA," *Methods in Enzymol.* 183:63-98, 1990.

The following running parameters are preferred for determination of alignments and identities using BLASTN that contribute to the E values and percentage identity of polynucleotides of the present invention: Unix running command: blastall -p blastn -d embldb -e 10 -G 0 -E 0 -r 1 -v 30-b 30 -i queryseq –o results; and the parameters are: -p Program Name [String]; -d Database [String]; -e Expectation value (E) [Real]; -G Cost to open a gap (zero invokes default behavior) [Integer]; -E Cost to extend a gap (zero invokes default behavior) [Integer]; -r Reward for a nucleotide match (blastn only) [Integer]; -v Number of

one-line descriptions (V) [Integer]; -b Number of alignments to show (B) [Integer]; -i Query File [File In]; -o BLAST report Output File [File Out] Optional.

The following running parameters are preferred for determination of alignments and identities using BLASTP that contribute to the E values and percentage identity of polypeptide sequences: For BLASTP the following running parameters are preferred: blastall –p blastp –d swissprotdb –e 10 –G 0 –E 0 –v 30 –b 30 –i queryseq –o results; and parameters are: -p Program Name [String]; -d Database [String]; -e Expectation value (E) [Real]; -G Cost to open a gap (zero invokes default behavior) [Integer]; -E Cost to extend a gap (zero invokes default behavior) [Integer]; -v Number of one-line descriptions (v) [Integer]; -b Number of alignments to show (b) [Integer]; -I Query File [File In]; -o BLAST report Output File [File Out] Optional.

The "hits" to one or more database sequences by a queried sequence produced by BLASTN, BLASTP, FASTA, or a similar algorithm, align and identify similar portions of sequences. The hits are arranged in order of the degree of similarity and the length of sequence overlap. Hits to a database sequence generally represent an overlap over only a fraction of the sequence length of the queried sequence.

The BLASTN and FASTA algorithms also produce "Expect" values for alignments. The Expect value (E) indicates the number of hits one can "expect" to see over a certain number of contiguous sequences by chance when searching a database of a certain size. The Expect value is used as a significance threshold for determining whether the hit to a database, such as the preferred EMBL database, indicates true similarity. For example, an E value of 0.1 assigned to a hit is interpreted as meaning that in a database of the size of the EMBL database, one might expect to see 0.1 matches over the aligned portion of the sequence with a similar score simply by chance. By this criterion, the aligned and matched portions of the sequences then have a probability of 90% of being the same. For sequences having an E value of 0.01 or less over aligned and matched portions, the probability of finding a match by chance in the EMBL database is 1% or less using the BLASTN or FASTA algorithm.

According to one embodiment, "variant" polynucleotides, with reference to each of the polynucleotides of the present invention, preferably comprise sequences having the same number or fewer nucleic acids than each of the polynucleotides of the present invention and producing an E value of 0.01 or less when compared to the polynucleotide of the present

invention. That is, a variant polynucleotide is any sequence that has at least a 99% probability of being the same as the polynucleotide of the present invention, measured as having an E value of 0.01 or less using the BLASTN or FASTA algorithms set at the default parameters. According to a preferred embodiment, a variant polynucleotide is a sequence having the same number or fewer nucleic acids than a polynucleotide of the present invention that has at least a 99% probability of being the same as the polynucleotide of the present invention, measured as having an E value of 0.01 or less using the BLASTN or FASTA algorithms set at the default parameters.

Alternatively, variant polynucleotide hybridize to the polynucleotide of the present invention under stringent conditions. As used herein, "stringent conditions" refers to prewashing in a solution of 6X SSC, 0.2% SDS; hybridizing at 65°C, 6X SSC, 0.2% SDS overnight; followed by two washes of 30 minutes each in 1X SSC, 0.1% SDS at 65°C and two washes of 30 minutes each in 0.2X SSC, 0.1% SDS at 65°C.

The present invention also encompasses polynucleotides that differ from the disclosed sequences but that, as a consequence of the discrepancy of the genetic code, encode a polypeptide having similar enzymatic activity as a polypeptide encoded by a polynucleotide of the present invention. Thus, polynucleotides comprising sequences that differ from the polynucleotide sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, or complements, reverse sequences, or reverse complements of those sequences as a result of conservative substitutions are contemplated by and encompassed within the present invention. Additionally, polynucleotides comprising sequences that differ from the polynucleotide sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, or complements, reverse complements, or reverse sequences as a result of deletions and/or insertions totaling less than 10% of the total sequence length are also contemplated by and encompassed within the present invention. Similarly, polypeptides comprising sequences that differ from the polypeptide sequences recited in SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148 as a result of amino acid substitutions, insertions, and/or deletions totaling less than 10% of the total sequence length are contemplated by an encompassed within the present invention, provided the variant polypeptide has activity in a cell wall polysaccharide synthesis pathway.

Variants of the polypeptide sequences recited in SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148, wherein the variant has an activity level that is different to that of the recited polypeptide are also encompassed by the present invention. In specific embodiments, variants of the inventive sucrose synthase (SUS) polypeptides are provided wherein the N-terminal serine phosphorylation site has been replaced by an acidic amino acid (such as Asp or Glu) by, for example, site directed mutagenesis. Nakai et al. have demonstrated that SUS polypeptides mutated in this manner possess increased activity compared to wild-type SUS (Nakai et al., *Plant Cell Physiol.* *39*:1337-1341, 1998). Polynucleotides encoding such variants of the inventive SUS polypeptides may therefore be employed in transgenic plants to increase cellulose production.

The polynucleotides of the present invention may be isolated from various libraries, or may be synthesized using techniques that are well known in the art. The polynucleotides may be synthesized, for example, using automated oligonucleotide synthesizers (*e.g.*, Beckman Oligo 1000M DNA Synthesizer) to obtain polynucleotide segments of up to 50 or more nucleic acids. A plurality of such polynucleotide segments may then be ligated using standard DNA manipulation techniques that are well known in the art of molecular biology. One conventional and exemplary polynucleotide synthesis technique involves synthesis of a single stranded polynucleotide segment having, for example, 80 nucleic acids, and hybridizing that segment to a synthesized complementary 85 nucleic acid segment to produce a 5 nucleotide overhang. The next segment may then be synthesized in a similar fashion, with a 5 nucleotide overhang on the opposite strand. The "sticky" ends ensure proper ligation when the two portions are hybridized. In this way, a complete polynucleotide of the present invention may be synthesized entirely *in vitro*.

Some of the polynucleotides identified as SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908 are referred to as "partial" sequences, in that they do not represent the full coding portion of a gene encoding a naturally occurring polypeptide. The partial polynucleotide sequences disclosed herein may be employed to obtain the corresponding full length genes for various species and organisms by, for example, screening DNA expression libraries using hybridization probes based on the polynucleotides of the present invention, or using PCR amplification with primers based upon the polynucleotides of the present invention. In this way one can, using methods well known in the art, extend a

polynucleotide of the present invention upstream and downstream of the corresponding mRNA, as well as identify the corresponding genomic DNA, including the promoter and enhancer regions, of the complete gene. The present invention thus comprehends isolated polynucleotides comprising a sequence identified in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, or a variant of one of the specified sequences, that encode a functional polypeptide, including full length genes. Such extended polynucleotides may have a length of from about 50 to about 4,000 nucleic acids or base pairs, and preferably have a length of less than about 4,000 nucleic acids or base pairs, more preferably yet a length of less than about 3,000 nucleic acids or base pairs, more preferably yet a length of less than about 2,000 nucleic acids or base pairs. Under some circumstances, extended polynucleotides of the present invention may have a length of less than about 1,800 nucleic acids or base pairs, preferably less than about 1,600 nucleic acids or base pairs, more preferably less than about 1,400 nucleic acids or base pairs, more preferably yet less than about 1,200 nucleic acids or base pairs, and most preferably less than about 1,000 nucleic acids or base pairs.

Polynucleotides of the present invention also comprehend polynucleotides comprising at least a specified number of contiguous residues (*x*-mers) of any of the polynucleotides identified as SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, complements, reverse sequences, and reverse complements of such sequences, and their variants. Similarly, polypeptides of the present invention comprehend polypeptides comprising at least a specified number of contiguous residues (*x*-mers) of any of the polypeptides identified as SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148, and their variants. As used herein, the term "*x*-mer," with reference to a specific value of "*x*," refers to a sequence comprising at least a specified number ("*x*") of contiguous residues of any of the polynucleotides identified as SEQ ID NO: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, or the polypeptides identified as SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148. According to preferred embodiments, the value of *x* is preferably at least 20; more preferably, at least 40; more preferably yet, at least 60; and most preferably, at least 80. Thus, polynucleotides and polypeptides of the present invention comprise a 20-mer, a 40-mer, a 60-mer, an 80-mer, a 100-mer, a 120-mer, a 150-mer, a 180-mer, a 220-mer, a 250-mer, or a 300-mer, 400-mer,

500-mer or 600-mer of a polynucleotide or polypeptide identified as SEQ ID NOS: 1-908, and variants thereof.

Polynucleotide probes and primers complementary to and/or corresponding to SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, and variants of those sequences, are also comprehended by the present invention. Such oligonucleotide probes and primers are substantially complementary to the polynucleotide of interest. As used herein, the term "oligonucleotide" refers to a relatively short segment of a polynucleotide sequence, generally comprising between 6 and 60 nucleotides, and comprehends both probes for use in hybridization assays and primers for use in the amplification of DNA by polymerase chain reaction.

An oligonucleotide probe or primer is described as "corresponding to" a polynucleotide of the present invention, including one of the sequences set out as SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, or a variant, if the oligonucleotide probe or primer, or its complement, is contained within one of the sequences set out as SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, or a variant of one of the specified sequences.

Two single stranded sequences are said to be substantially complementary when the nucleotides of one strand, optimally aligned and compared, with the appropriate nucleotide insertions and/or deletions, pair with at least 80%, preferably at least 90% to 95%, and more preferably at least 98% to 100%, of the nucleotides of the other strand. Alternatively, substantial complementarity exists when a first DNA strand will selectively hybridize to a second DNA strand under stringent hybridization conditions. Stringent hybridization conditions for determining complementarity include salt conditions of less than about 1 M, more usually less than about 500 mM, and preferably less than about 200 mM. Hybridization temperatures can be as low as 5°C, but are generally greater than about 22°C, more preferably greater than about 30°C, and most preferably greater than about 37°C. Longer DNA fragments may require higher hybridization temperatures for specific hybridization. Since the stringency of hybridization may be affected by other factors such as probe composition, presence of organic solvents and extent of base mismatching, the combination of parameters is more important than the absolute measure of any one alone. The DNA from plants or

samples or products containing plant material can be either genomic DNA or DNA derived by preparing cDNA from the RNA present in the sample.

In addition to DNA-DNA hybridization, DNA-RNA or RNA-RNA hybridization assays are also possible. In the first case, the mRNA from expressed genes would then be detected instead of genomic DNA or cDNA derived from mRNA of the sample. In the second case, RNA probes could be used. In addition, artificial analogs of DNA hybridizing specifically to target sequences could also be used.

In specific embodiments, the oligonucleotide probes and/or primers comprise at least about 6 contiguous residues, more preferably at least about 10 contiguous residues, and most preferably at least about 20 contiguous residues complementary to a polynucleotide sequence of the present invention. Probes and primers of the present invention may be from about 8 to 100 base pairs in length or, preferably from about 10 to 50 base pairs in length or, more preferably from about 15 to 40 base pairs in length. The probes can be easily selected using procedures well known in the art, taking into account DNA-DNA hybridization stringencies, annealing and melting temperatures, and potential for formation of loops and other factors, which are well known in the art. Tools and software suitable for designing probes, and especially suitable for designing PCR primers, are available on the Internet, for example, at URL http://www.horizonpress.com/pcr/. Preferred techniques for designing PCR primers are also disclosed in Dieffenbach CW and Dyksler GS, *PCR primer: a laboratory manual*, CSHL Press: Cold Spring Harbor, NY, 1995.

A plurality of oligonucleotide probes or primers corresponding to a polynucleotide of the present invention may be provided in a kit form. Such kits generally comprise multiple DNA or oligonucleotide probes, each probe being specific for a polynucleotide sequence. Kits of the present invention may comprise one or more probes or primers corresponding to a polynucleotide of the present invention, including a polynucleotide sequence identified in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908.

In one embodiment, the present invention provides genetic that include an open reading frame coding for at least a functional portion of a polypeptide encoded by a polynucleotide of the present invention or a variant thereof. As used herein, the "functional portion" of a polypeptide is that portion which contains the active site essential for affecting the metabolic step, *i.e.*, the portion of the molecule that is capable of binding one or more

reactants or is capable of improving or regulating the rate of reaction. The functional portion can be determined by targeted mutagenesis and screening of modified protein products with protocols well known in the art. Normally, the functional portion is 10-20 amino acids, but can be shorter or longer. The active site may be made up of separate portions present on one or more polypeptide chains and will generally exhibit high substrate specificity. The term "polypeptide encoded by a polynucleotide" as used herein, includes polypeptides encoded by a nucleotide sequence which includes the partial isolated DNA sequences of the present invention.

The open reading frame may be inserted in the genetic construct in a sense or antisense orientation, such that transformation of a target plant with the genetic construct will produce a change in the amount or structure of the polypeptide compared to the wild-type plant. Transformation with a genetic construct comprising an open reading frame in a sense orientation will generally result in modified expression of the selected gene, while transformation with a genetic construct comprising an open reading frame in an antisense orientation also generally results in modified expression of the selected gene. A population of plants transformed with a genetic construct comprising an open reading frame of the present invention in either a sense or antisense orientation may be screened for increased or reduced expression of the gene in question using techniques well known to those of skill in the art, and plants having the desired phenotypes may thus be isolated.

Alternatively, expression of a gene involved in the biosynthesis of polysaccharides may be inhibited by inserting a portion of an open reading frame of the present invention, in either sense or antisense orientation, in the genetic construct. Such portions need not be full-length but preferably comprise at least 25 and more preferably at least 50 residues of a polynucleotide of the present invention. A much longer portion or even the full length polynucleotide corresponding to the complete open reading frame may be employed. The portion of the open reading frame does not need to be precisely the same as the endogenous sequence, provided that there is sufficient sequence similarity to achieve inhibition of the target gene. Thus a sequence derived from one species may be used to inhibit expression of a gene in a different species.

In a second embodiment, the inventive genetic constructs comprise a polynucleotide including a non-coding region of a gene coding for a polypeptide encoded by a polynucleotide

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(57) Abstract

Novel isolated polynucleotides and polypeptides associated with the synthesis of plant cell wall polysaccharides are provided, together with genetic constructs comprising such sequences. Methods for using such constructs for the modulation of polysaccharide content in plants are also disclosed, together with transgenic plants comprising such constructs.

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MATERIALS AND METHODS FOR THE MODIFICATION OF PLANT CELL WALL POLYSACCHARIDES

Technical Field of the Invention

This invention relates to the field of modification of cell wall polysaccharide content and composition in plants. More particularly, this invention relates to enzymes involved in the synthesis of plant cell wall polysaccharides and nucleotide sequences encoding such enzymes.

Background of the Invention

Plant cells are characterised by having a rigid cell wall. These cell walls are comprised primarily of polymers of simple sugar monomers linked in a variety of linear or branched polymers known as polysaccharides. The most abundant simple sugar monomer is glucose, and the most abundant polymer is cellulose. Cellulose is a linear, unbranched polymer, comprised of β-1,4 linked glucose monomers. Other polysaccharides found in plant cell walls include hemicellulose, which is a group of polysaccharides comprised of β-1,4 linked glucose monomers having side chains which may include sugars other than glucose. These side chains frequently include xylose, fucose, arabinose, and galactose. Pectins are another type of polysaccharide found in plant cell walls. Pectins are acidic polysaccharides, which are generally comprised primarily of galacturonic acid and rhamnose sugar monomers. Amylose is an additional common plant polysaccharide which is not usually found as a major component of cell walls. It acts primarily as a storage material for glucose, rather than as a structural polymer. However, because amylose is comprised primarily of α-1,4-linked glucose monomers, it is considered to be a related polymer from a biochemical and physiological perspective.

Plant polysaccharides have many uses. Certain plastics, such as cellulose acetate, and synthetic textiles, such as rayon, are made from cellulose. In addition, some biodegradable plastics and digestible medicine capsules, as well as medical fillers and fiber additives for food, can be made from plant polysaccharides.

In foodstuffs, polysaccharides have a profound impact on food quality. Cell walls contribute to crispness in carrots, while degradation of cell walls is required for softening of fruits, such as peaches and tomatoes. In maize, increased amylose is desirable for cattle feed, but not for human consumption, and increased cell wall strength reduces digestibility. In fiber crops, such as timber, cellulose is the primary polymer of interest. Wood density, a fundamental measure of structural timber quality, is essentially a measure of cellulose content. In the paper pulping industry, efficiency is measured in terms of yield of cellulose. Clearly, the ability to increase cellulose content in timber is an important economic goal.

The sugars which make up plant cell wall polysaccharides are produced in the photosynthetic organs of plants. The sugars so produced are commonly converted into sucrose, a disaccharide consisting of glucose and fructose. Sucrose is transported throughout the plant, to wherever sugar monomers are called for. Thus, the photosynthetic organs are often referred to as a source, while tissues requiring large amounts of sugar monomers are referred to as a sink. Actively growing regions of the plant are generally sink tissues, as new cell wall synthesis requires large amounts of sugar monomers.

When the transported sucrose arrives at the sink destination, it must be converted into whichever kind of sugar monomer is required. The sugar monomers which make up plant cell walls are primarily 5- or 6-carbon sugars. Different sugars are generally distinguished by stereospecific orientation of hydroxyl groups. Plants contain a variety of enzymes, such as isomerases or epimerases, which can rapidly change the orientation of these hydroxyls. In addition, there are a number of enzymes which can add or remove a single carbon from a sugar monomer. The result is a single pool of sugar monomers which the plant can freely inter-convert into whichever kind is needed for cell wall synthesis.

Plant polysaccharides are thus biochemically and physiologically inter-related. All polymers compete for the same pool of sugar monomers, and all sugar monomers can be freely interconverted to other types. Degradation of any one polymer will provide building material for any other. Attempts to engineer changes in one polymer may therefore have pleiotropic effects on other polymers.

The rate of cell wall synthesis is dependent on both the availability of sugar monomers to serve as building blocks for the polymers of the wall, and the enzymes which polymerise those building blocks into polymers. Enzymes which are directly responsible for the

synthesis of the major cell wall polymers, such as cellulose, hemicellulose and pectin, may have a profound impact on the rate of cell wall synthesis. Source-sink relations may play an important role in limiting cell wall synthesis, if the availability of substrates becomes limiting. Polymer degrading enzymes may liberate sugar monomers from unnecessary polymers for use in building new, desired polymers. Enzymes which can isomerise sugars from one form into another can convert the sugars into whichever kind is needed. Each of the different types of cell wall polysaccharides effectively competes for the same pool of sugar monomers, and each represents a potential source of monomers for any of the other polymers.

The final committed steps in cellulose biosynthesis involve a relatively small number of enzymes. Cellulose synthase (CEL) is believed to function as part of a large, membrane-bound complex which also includes sucrose synthase (SUS: Amor et al., *Proc. Natl. Acad. Sci USA* 92:9353-9357, 1995) and annexin (ANX: Clark and Roux, *Plant Phys.* 109:1133-1139, 1995). This enzyme complex polymerises activated glucose into the cellulose polymer. The glucose is activated by UDP-glucose pyrophosphorylase (UGP), also known as UTP-glucose-1-phosphate uridylyltransferase. These enzymes are believed to be sufficient for the biosynthesis of cellulose from glucose. Other than these steps, the availability of glucose appears to be the most significant rate-limiting step in cellulose biosynthesis.

Glucose is primarily stored in most plants as amylose. Plants routinely store amylose and degrade it to free up the glucose monomers, as needed. By inhibiting the efficiency of glucose storage, or by increasing the liberation of glucose from amylose, the availability of glucose monomers for cellulose biosynthesis can be increased. The rate-limiting enzyme in the storage of glucose as amylose is ADP-glucose pyrophosphorylase (AGP), also known as ATP-glucose-1-phosphate adenylyltransferase (Iglesias et al., *J. Biol. Chem.* 268:1081-1086, 1993). Conversely, the enzyme most responsible for liberating glucose from amylose is amylase (AMA: Kawagoe and Delmer, *Genetic Engineering* 19:63-87, 1997).

These enzymes clearly will be important in the engineering of economically useful changes in cellulose biosynthesis. In addition, there are many other enzymes which may be useful in influencing plant cell wall polysaccharide biosynthesis. Other enzymes likely to be involved in cellulose biosynthesis include 1,4-β-cellobiohydrolase, β-glucosidase, calnexin, cellobiose epimerase, cellobiose phosphorylase, cellulase A, dextransucrase, invertase, phosphodiesterase, phosphoglucomutase, sucrose phosphate synthase, sucrose phosphorylase,

UDP-glucose 4-epimerase and UDP-glucose dehydrogenase. Enzymes believed to be involved in hemicellulose biosynthesis include β-glucanase, arabinan synthase, GDP-fucose pyrophosphorylase, GDP-mannose pyrophosphorylase, 1,3 and 1,4-β-glucanases, 1,3 and 1,4-β-glucosidases, mannose-6-phosphate isomerase, *n*DP-hexose pyrophosphorylase, xyloglucan endotransglycosylase and xyloglucan synthase. Enzymes likely to be involved in pectin biosynthesis include α-galactosidase, β-glucuronidase, exopolygalacturonase, glucuronosyl-transferase, pectin methyl-esterase, polygalacturonase and UDP-hexose-1-phosphate uridylyltransferase. Enzymes believed to be involved in amylose biosynthesis include α–glucosidase, amylopectin 6-glucanohydrolase, amylopectin-branching glycosyltransferase, β–amylase, branching enzyme, inulosucrase, isoamylase, isomaltase, levansucrase, starch phosphorylase and starch synthase. Enzymes likely to be involved in the interconversion of 5-carbon sugars include 2-dehydro-3-deoxy-gluconokinase, aldehyde reductase, arabinose isomerase, D-arabinitol dehydrogenase, D-xylulose reductase, endo-1,4-β-xylanase, exo-1,4-β-xylanase, L-arabinose isomerase, L-ribulokinase, L-xylulokinase, phospho-ribulokinase, ribose 5-phosphate isomerase, ribulose-phosphate-3-epimerase, ribulose-phosphate-4-epimerase, transaldolase, transketolase, xylose isomerase and xylulokinase. Enzymes likely to be involved in interconversion of 6-carbon sugars include 6-phospho-fructo-1-kinase, 6-phospho-fructo-2-kinase, trehalose phosphate synthase, aldolase, aldose 1-epimerase, D-fructokinase, D-galactokinase, fructose 1,6-diphosphatase, gluconolactonase, glucose 1-phosphatase, glucose 6-phosphatase, glucose 6-phosphate dehydrogenase, glucose-phosphate isomerase, hexokinase, phosphoglucomutase, trehalase, trehalose phosphatase and UDP-galactose dehydrogenase.

While DNA sequences encoding some of the enzymes involved in the biosynthetic pathways of plant cell wall polysaccharides have been isolated for certain species of plants, genes encoding many of the enzymes in a wide range of plant species have not yet been identified. Thus, there remains a need in the art for materials useful in the modification of cell wall polysaccharide content and composition in plants.

Summary of the Invention

Briefly, the present invention provides polynucleotides isolated from eucalyptus and pine which encode enzymes involved in the synthesis of cell wall polysaccharides. Genetic constructs including such sequences and methods for the use of such constructs are also provided, together with transgenic plants having altered cell wall polysaccharide content and composition.

In one embodiment, the isolated polynucleotides comprise a nucleotide sequence selected from the group consisting of: (a) sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; (b) complements of the sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; (c) reverse complements of the sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; (d) reverse sequences of the sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; and (e) sequences having either 40%, 60%, 75% or 90% identical nucleotides, as defined herein, to a sequence of (a) – (d).

In a further aspect, isolated polypeptides encoded by a polynucleotide of the present invention are provided. In one embodiment, such polypeptides comprise an amino acid sequence selected from the group consisting of SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148, and variants thereof.

In another aspect, the invention provides genetic constructs comprising a polynucleotide of the present invention, either alone, in combination with one or more of the inventive polynucleotide sequences, or in combination with one or more known polynucleotides, together with transgenic cells comprising such constructs.

In a related aspect, the present invention provides genetic constructs comprising, in the 5'-3' direction, a gene promoter sequence; an open reading frame coding for at least a functional portion of an enzyme encoded by a polynucleotide of the present invention or a variant thereof; and a gene termination sequence. The open reading frame may be orientated in either a sense or antisense direction. Genetic constructs comprising a non-coding region of a gene coding for an enzyme encoded by the above polynucleotides or a nucleotide sequence complementary to a non-coding region, together with a gene promoter sequence and a gene termination sequence, are also provided. Preferably, the gene promoter and termination

sequences are functional in a host plant. Most preferably, the gene promoter and termination sequences are those of the original enzyme genes but others generally used in the art, such as the Cauliflower Mosaic Virus (CMV) promoter, with or without enhancers such as the Kozak sequence or Omega enhancer, and *Agrobacterium tumefaciens* nopalin synthase terminator may be usefully employed in the present invention. Tissue-specific promoters may be employed in order to target expression to one or more desired tissues. In a preferred embodiment, the gene promoter sequence provides for transcription in xylem. The genetic construct may further include a marker for the identification of transformed cells.

In a further aspect, transgenic plant cells comprising the genetic constructs of the present invention are provided, together with plants comprising such transgenic cells, and fruits, seeds and other products, derivatives, or progeny of such forestry plants. Propagules of the transgenic plants transformed with the inventive polynucleotides are also included in the present invention. As used herein, the word "propagule" means any part of a plant that may be used in reproduction or propagation, sexual or asexual, including cuttings.

Plant varieties, particularly registrable plant varieties according to Plant Breeders' Rights, may be excluded from the present invention. A plant need not be considered a "plant variety" simply because it contains stably within its genome a transgene, introduced into a cell of the plant or an ancestor thereof.

In yet another aspect, methods for modulating the polysaccharide content and composition of an organism, such as a plant, are provided, such methods including stably incorporating into the genome of the plant a genetic construct of the present invention. In a preferred embodiment, the target plant is a woody plant, preferably selected from the group consisting of eucalyptus, pine, acacia, poplar, sweetgum, teak and mahogany species, more preferably from the group consisting of pine and eucalyptus species, and most preferably from the group consisting of *Eucalyptus grandis* and *Pinus radiata*. In a related aspect, a method for producing a plant having modified cellulose content is provided, the method comprising transforming a plant cell with a genetic construct of the present invention to provide a transgenic cell and cultivating the transgenic cell under conditions conducive to regeneration and mature plant growth.

In yet a further aspect, the present invention provides methods for modifying the activity of a polypeptide in a plant, comprising stably incorporating into the genome of the

plant a genetic construct of the present invention. In a preferred embodiment, the target plant is a woody plant, preferably selected from the group consisting of eucalyptus, pine, acacia, poplar, sweetgum, teak and mahogany species, more preferably from the group consisting of pine and eucalyptus species, and most preferably from the group consisting of *Eucalyptus grandis* and *Pinus radiata*.

The above-mentioned and additional features of the present invention and the manner of obtaining them will become apparent, and the invention will be best understood by reference to the following more detailed description. All references disclosed herein are hereby incorporated by reference in their entirety as if each was incorporated individually.

Brief Description of the Figures

Fig. 1 illustrates the level of native CEL enzyme activity in positive control mung bean (*V. radiata*) plants.

Fig. 2 illustrates the level of CEL enzyme activity in mammalian 293T cells transfected with *E. grandis* CEL as compared to that in non-transfected 293T cells.

Detailed Description

As outlined above, cellulose is formed by polymerization of glucose into a linear, unbranched, polymer comprised of β-1,4 linked glucose monomers (Kawagoe and Delmer, *Genetic Engineering*, 19:63-87, 1997). Cellulose is the most important plant cell wall polysaccharide from both a structural, as well as industrial, perspective. Other polysaccharides are essential for healthy cell walls, as well as for many alternative industrial uses.

Glucose monomers are most commonly stored in the plant in the form of amylose by the action of several enzymes, with the rate limiting step for storage being catalysed by AGP (Iglesias et al., *J. Biol. Chem.* 268:1081-1086). Glucose monomers are freed from this storage polymer by the action of the enzyme AMA. The free monomers are activated by the action of the enzyme UGP, and polymerised into cellulose macro-crystalline structures by the action of the cellulose synthase enzyme complex. Pure CEL enzyme has been shown to form β-1,4 glucose linkages *in vitro*, but has not been shown to be sufficient for polymerization of the

large polymers which are fundamental to the structure of plant cell walls. The holoenzyme complex appears to be necessary for this latter function. The holoenzyme is believed to be comprised of the CEL enzyme in combination with the SUS enzyme and ANX, the whole complex being integrated into the plasma membrane and forming a "rosette" structure as seen in electron micrographs of plant cell membranes (Arioli et al., *Science* 279:717-720, 1998).

Because cellulose synthesis can represent such a large sink for sugar monomers in the cell, changes in the rate of cellulose synthesis can have a profound influence on the synthesis of other plant polysaccharides. Conversely, changes in the rates of synthesis of other plant polysaccharides can have a profound influence on the pool of sugars available for synthesis of cellulose. Hence, changes in the synthesis of any single polymer may affect both the content and composition of plant cell wall polysaccharides, and polysaccharides in general.

Quantitative and qualitative modifications in plant polysaccharide content are known to be induced by external factors such as light stimulation, low calcium levels, and mechanical stress. Synthesis of cell wall polysaccharides can also be induced by infection with pathogens.

Using the methods and materials of the present invention, the polysaccharide content of a plant may be increased or reduced, by incorporating additional copies of genes encoding enzymes involved in the synthesis of cell wall polysaccharides into the genome of the target plant. Similarly, an increase or decrease in polysaccharide content may be obtained by transforming the target plant with antisense copies of such genes. In addition, the number of copies of genes encoding for different enzymes in the biosynthetic pathway of cell wall polysaccharides can be manipulated to modify the relative amount of each monosaccharide synthesized, thereby leading to the formation of cell walls having altered composition. The alteration of polysaccharide composition would be advantageous, for example, in tree processing for paper.

The polynucleotides of the present invention were isolated from forestry plant sources, namely from *Eucalyptus grandis* and *Pinus radiata*, but they may alternatively be synthesized using conventional synthesis techniques. Specifically, isolated polynucleotides of the present invention include polynucleotides comprising a sequence selected from the group consisting of sequences identified as SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; complements of the sequences identified as SEQ ID NOS: 1-29, 57-80, 105,

107, 109-113, 119-129, 139-143 and 149-908; reverse complements of the sequences identified as SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; at least a specified number of contiguous residues (*x*-mers) of any of the above-mentioned polynucleotides; extended sequences corresponding to any of the above polynucleotides; antisense sequences corresponding to any of the above polynucleotides; and variants of any of the above polynucleotides, as that term is described in this specification.

In another embodiment, the present invention provides isolated polypeptides encoded by the DNA sequences of SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908;. The predicted amino acid sequences encoded by SEQ ID NOS: 1-22, 24-28, 57-80, 105, 107, 109-113 and 119-143, based on the best available information at the time of filing this application, are provided in SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148, respectively. The present invention also encompasses polynucleotides that differ from the disclosed sequences but which, due to the degeneracy of the genetic code, encode a polypeptide which is the same as that encoded by a polypeptide of the present invention. Such polynucleotides are said to be "degeneratively equivalent" to a polynucleotide sequence disclosed herein.

The polynucleotides and polypeptides of the present invention were putatively identified by DNA and polypeptide similarity searches. In the attached Sequence Listing SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908 are polynucleotide sequences, and SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148 are polypeptide sequences. The polynucleotides and polypeptides of the present invention, have demonstrated similarity to enzymes that are known to be involved in the synthesis of cell wall polysaccharides. The putative identity of each of the inventive polynucleotides is shown below in Table 1.

TABLE 1

DNA SEQ ID NO:	PROTEIN SEQ ID NO:	IDENTITY
1	30	AGP
2	31	AGP
3	32	AGP
4	33	AMA

DNA SEQ ID NO:	PROTEIN SEQ ID NO:	IDENTITY
5	34	AMA
6	35	AMA
7	36	CEL
8	37	CEL
9	38	CEL
10	39	CEL
11	40	CEL
12	41	CEL
13	42	CEL
14	43	CEL
15	44	SUS
16	45	SUS
17	46	SUS
18	47	SUS
19	48	SUS
20	49	UGP
21	50	UGP
22	51	UGP
23	-	UGP
24	52	ANX
25	53	ANX
26	54	ANX
27	55	ANX
28	56	ANX
29	-	ANX
57	81	AMA
58	82	AMA
59	83	AGP
60	84	AGP
61	85	AGP
62	86	AGP
63	87	AGP
64	88	AGP
65	89	AGP
66	90	CEL
67	91	CEL
68	92	CEL
69	93	CEL
70	94	CEL
71	95	SUS
72	96	SUS
73	97	SUS
74	98	SUS
75	99	SUS
76	100	SUS
77	101	SUS
78	102	SUS
79	103	UGP
80	104	UGP

DNA SEQ ID NO:	PROTEIN SEQ ID NO:	IDENTITY
105	106	SUS
107	108	CEL
109	114	ANX
110	115	ANX
111	116	ANX
112	117	ANX
113	118	ANX
119	129	CEL
120	130	CEL
121	131	CEL
122	132	CEL
123	133	CEL
124	134	CEL
125	135	CEL
126	136	CEL
127	137	CEL
128	138	CEL
135	144	SUS
140	145	α-amylase
141	146	CEL
142	147	AGP (3' end of SEQ ID NO: 62)
143	148	SUS (3' of SEQ ID NO: 74)
149-185	-	1,3-β-D-Glucanase
186	-	1,4-β-Cellobiohydrolase
187-196	-	α,α-trehalose phosphate synthase
197-204	-	α-glucosidase
205-250	-	aldolase
251	-	Amylopectin 6-glucanohydrolase
252-262	-	β-amylase
263	-	β-glucosidase
264-272	-	Branching enzyme
273-318	-	D-fructokinase
319-354	-	D-xylulose reductase
355-365	-	Endo-1,3-1,4-β-glucanase
366-371	-	Glucan exo-1,3-β-glucosidase
372-377	-	Glucose 6-phosphate dehydrogenase
378-381	-	Glucose phosphate isomerase
382-389	-	Isoamylase
390-393	-	L-ribulokinase
394-398	-	Mannitol-1-phosphate 5-dehydrogenase
399-478	-	Pectin methyl-esterase
479-506	-	Phosphoglucomutase
507-508	-	Phospho-ribulokinase
509-521	-	Ribulose-phosphate-3-epimerase
522-530	-	Starch phosphorylase
531-551	-	Sucrose phosphate synthase
552-555	-	SUS
556-586	-	Transketolase
587-591	-	Trehalase

DNA SEQ ID NO:	PROTEIN SEQ ID NO:	IDENTITY
592-620	-	UDP-glucose 4-epimerase
621-902	-	Xyloglucan endotransglycosylase
903-908	-	Xylose isomerase

The term "polynucleotide(s)," as used herein, means a single or double-stranded polymer of deoxyribonucleotide or ribonucleotide bases and includes DNA and corresponding RNA molecules, including HnRNA and mRNA molecules, both sense and anti-sense strands, and comprehends cDNA, genomic DNA and recombinant DNA, as well as wholly or partially synthesized polynucleotides. An HnRNA molecule contains introns and corresponds to a DNA molecule in a generally one-to-one manner. An mRNA molecule corresponds to an HnRNA and DNA molecule from which the introns have been excised. A polynucleotide may consist of an entire gene, or any portion thereof. Operable anti-sense polynucleotides may comprise a fragment of the corresponding polynucleotide, and the definition of "polynucleotide" therefore includes all such operable anti-sense fragments.

The term "polypeptide", as used herein, encompasses amino acid chains of any length including full length proteins, wherein amino acid residues are linked by covalent peptide bonds. Polypeptides of the present invention may be naturally purified products, or may be produced partially or wholly using recombinant techniques.

The definition of the terms "complement", "reverse complement" and "reverse sequence", as used herein, is best illustrated by the following example. For the sequence 5' AGGACC 3', the complement, reverse complement and reverse sequence are as follows:

complement	3' TCCTGG 5'
reverse complement	3' GGTCCT 5'
reverse sequence	5' CCAGGA 3'.

As used herein, the term "variant" covers any sequence which has at least about 40%, more preferably at least about 60%, more preferably yet at least about 75% and most preferably at least about 90% identical residues (either nucleotides or amino acids) to a sequence of the present invention. The percentage of identical residues is determined by aligning the two sequences to be compared, determining the number of identical residues in

the aligned portion, dividing that number by the total length of the inventive, or queried, sequence and multiplying the result by 100.

Polynucleotide or polypeptide sequences may be aligned, and percentage of identical nucleotides in a specified region may be determined against another polynucleotide, using computer algorithms that are publicly available. Two exemplary algorithms for aligning and identifying the similarity of polynucleotide sequences are the BLASTN and FASTA algorithms. The similarity of polypeptide sequences may be examined using the BLASTP algorithm. Both the BLASTN and BLASTP software are available on the NCBI anonymous FTP server (ftp://ncbi.nlm.nih.gov) under /blast/executables/. The BLASTN algorithm Version 2.0.6 [Sept-16-1998], set to the default parameters described in the documentation and distributed with the algorithm, is preferred for use in the determination of variants according to the present invention. The use of the BLAST family of algorithms, including BLASTN and BLASTP, is described at NCBI's Internet website at the URL http://www.ncbi.nlm.nih.gov/BLAST/newblast.html and in the publication of Altschul, Stephen F, et al., "Gapped BLAST and PSI-BLAST: a new generation of protein database search programs," *Nucleic Acids Res.* 25:3389-3402, 1997. The computer algorithm FASTA is available on the Internet at the ftp site ftp://ftp.virginia.edu/pub/fasta/. Version 2.04, [February 1996], set to the default parameters described in the documentation and distributed with the algorithm, is preferred for use in the determination of variants according to the present invention. The use of the FASTA algorithm is described in Pearson WR and Lipman DJ, "Improved Tools for Biological Sequence Analysis," *Proc. Natl. Acad. Sci. USA* 85:2444-2448, 1988; and Pearson WR, "Rapid and Sensitive Sequence Comparison with FASTP and FASTA," *Methods in Enzymol.* 183:63-98, 1990.

The following running parameters are preferred for determination of alignments and identities using BLASTN that contribute to the E values and percentage identity of polynucleotides of the present invention: Unix running command: blastall -p blastn -d embldb -e 10 -G 0 -E 0 -r 1 -v 30-b 30 -i queryseq –o results; and the parameters are: -p Program Name [String]; -d Database [String]; -e Expectation value (E) [Real]; -G Cost to open a gap (zero invokes default behavior) [Integer]; -E Cost to extend a gap (zero invokes default behavior) [Integer]; -r Reward for a nucleotide match (blastn only) [Integer]; -v Number of

one-line descriptions (V) [Integer]; -b Number of alignments to show (B) [Integer]; -i Query File [File In]; -o BLAST report Output File [File Out] Optional.

The following running parameters are preferred for determination of alignments and identities using BLASTP that contribute to the E values and percentage identity of polypeptide sequences: For BLASTP the following running parameters are preferred: blastall –p blastp –d swissprotdb –e 10 –G 0 –E 0 –v 30 –b 30 –i queryseq –o results; and parameters are: -p Program Name [String]; -d Database [String]; -e Expectation value (E) [Real]; -G Cost to open a gap (zero invokes default behavior) [Integer]; -E Cost to extend a gap (zero invokes default behavior) [Integer]; -v Number of one-line descriptions (v) [Integer]; -b Number of alignments to show (b) [Integer]; -I Query File [File In]; -o BLAST report Output File [File Out] Optional.

The "hits" to one or more database sequences by a queried sequence produced by BLASTN, BLASTP, FASTA, or a similar algorithm, align and identify similar portions of sequences. The hits are arranged in order of the degree of similarity and the length of sequence overlap. Hits to a database sequence generally represent an overlap over only a fraction of the sequence length of the queried sequence.

The BLASTN and FASTA algorithms also produce "Expect" values for alignments. The Expect value (E) indicates the number of hits one can "expect" to see over a certain number of contiguous sequences by chance when searching a database of a certain size. The Expect value is used as a significance threshold for determining whether the hit to a database, such as the preferred EMBL database, indicates true similarity. For example, an E value of 0.1 assigned to a hit is interpreted as meaning that in a database of the size of the EMBL database, one might expect to see 0.1 matches over the aligned portion of the sequence with a similar score simply by chance. By this criterion, the aligned and matched portions of the sequences then have a probability of 90% of being the same. For sequences having an E value of 0.01 or less over aligned and matched portions, the probability of finding a match by chance in the EMBL database is 1% or less using the BLASTN or FASTA algorithm.

According to one embodiment, "variant" polynucleotides, with reference to each of the polynucleotides of the present invention, preferably comprise sequences having the same number or fewer nucleic acids than each of the polynucleotides of the present invention and producing an E value of 0.01 or less when compared to the polynucleotide of the present

invention. That is, a variant polynucleotide is any sequence that has at least a 99% probability of being the same as the polynucleotide of the present invention, measured as having an E value of 0.01 or less using the BLASTN or FASTA algorithms set at the default parameters. According to a preferred embodiment, a variant polynucleotide is a sequence having the same number or fewer nucleic acids than a polynucleotide of the present invention that has at least a 99% probability of being the same as the polynucleotide of the present invention, measured as having an E value of 0.01 or less using the BLASTN or FASTA algorithms set at the default parameters.

Alternatively, variant polynucleotide hybridize to the polynucleotide of the present invention under stringent conditions. As used herein, "stringent conditions" refers to prewashing in a solution of 6X SSC, 0.2% SDS; hybridizing at 65°C, 6X SSC, 0.2% SDS overnight; followed by two washes of 30 minutes each in 1X SSC, 0.1% SDS at 65°C and two washes of 30 minutes each in 0.2X SSC, 0.1% SDS at 65°C.

The present invention also encompasses polynucleotides that differ from the disclosed sequences but that, as a consequence of the discrepancy of the genetic code, encode a polypeptide having similar enzymatic activity as a polypeptide encoded by a polynucleotide of the present invention. Thus, polynucleotides comprising sequences that differ from the polynucleotide sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, or complements, reverse sequences, or reverse complements of those sequences as a result of conservative substitutions are contemplated by and encompassed within the present invention. Additionally, polynucleotides comprising sequences that differ from the polynucleotide sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, or complements, reverse complements, or reverse sequences as a result of deletions and/or insertions totaling less than 10% of the total sequence length are also contemplated by and encompassed within the present invention. Similarly, polypeptides comprising sequences that differ from the polypeptide sequences recited in SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148 as a result of amino acid substitutions, insertions, and/or deletions totaling less than 10% of the total sequence length are contemplated by an encompassed within the present invention, provided the variant polypeptide has activity in a cell wall polysaccharide synthesis pathway.

Variants of the polypeptide sequences recited in SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148, wherein the variant has an activity level that is different to that of the recited polypeptide are also encompassed by the present invention. In specific embodiments, variants of the inventive sucrose synthase (SUS) polypeptides are provided wherein the N-terminal serine phosphorylation site has been replaced by an acidic amino acid (such as Asp or Glu) by, for example, site directed mutagenesis. Nakai et al. have demonstrated that SUS polypeptides mutated in this manner possess increased activity compared to wild-type SUS (Nakai et al., *Plant Cell Physiol. 39*:1337-1341, 1998). Polynucleotides encoding such variants of the inventive SUS polypeptides may therefore be employed in transgenic plants to increase cellulose production.

The polynucleotides of the present invention may be isolated from various libraries, or may be synthesized using techniques that are well known in the art. The polynucleotides may be synthesized, for example, using automated oligonucleotide synthesizers (*e.g.*, Beckman Oligo 1000M DNA Synthesizer) to obtain polynucleotide segments of up to 50 or more nucleic acids. A plurality of such polynucleotide segments may then be ligated using standard DNA manipulation techniques that are well known in the art of molecular biology. One conventional and exemplary polynucleotide synthesis technique involves synthesis of a single stranded polynucleotide segment having, for example, 80 nucleic acids, and hybridizing that segment to a synthesized complementary 85 nucleic acid segment to produce a 5 nucleotide overhang. The next segment may then be synthesized in a similar fashion, with a 5 nucleotide overhang on the opposite strand. The "sticky" ends ensure proper ligation when the two portions are hybridized. In this way, a complete polynucleotide of the present invention may be synthesized entirely *in vitro*.

Some of the polynucleotides identified as SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908 are referred to as "partial" sequences, in that they do not represent the full coding portion of a gene encoding a naturally occurring polypeptide. The partial polynucleotide sequences disclosed herein may be employed to obtain the corresponding full length genes for various species and organisms by, for example, screening DNA expression libraries using hybridization probes based on the polynucleotides of the present invention, or using PCR amplification with primers based upon the polynucleotides of the present invention. In this way one can, using methods well known in the art, extend a

polynucleotide of the present invention upstream and downstream of the corresponding mRNA, as well as identify the corresponding genomic DNA, including the promoter and enhancer regions, of the complete gene. The present invention thus comprehends isolated polynucleotides comprising a sequence identified in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, or a variant of one of the specified sequences, that encode a functional polypeptide, including full length genes. Such extended polynucleotides may have a length of from about 50 to about 4,000 nucleic acids or base pairs, and preferably have a length of less than about 4,000 nucleic acids or base pairs, more preferably yet a length of less than about 3,000 nucleic acids or base pairs, more preferably yet a length of less than about 2,000 nucleic acids or base pairs. Under some circumstances, extended polynucleotides of the present invention may have a length of less than about 1,800 nucleic acids or base pairs, preferably less than about 1,600 nucleic acids or base pairs, more preferably less than about 1,400 nucleic acids or base pairs, more preferably yet less than about 1,200 nucleic acids or base pairs, and most preferably less than about 1,000 nucleic acids or base pairs.

Polynucleotides of the present invention also comprehend polynucleotides comprising at least a specified number of contiguous residues (*x*-mers) of any of the polynucleotides identified as SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, complements, reverse sequences, and reverse complements of such sequences, and their variants. Similarly, polypeptides of the present invention comprehend polypeptides comprising at least a specified number of contiguous residues (*x*-mers) of any of the polypeptides identified as SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148, and their variants. As used herein, the term "*x*-mer," with reference to a specific value of "*x*," refers to a sequence comprising at least a specified number ("*x*") of contiguous residues of any of the polynucleotides identified as SEQ ID NO: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, or the polypeptides identified as SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148. According to preferred embodiments, the value of *x* is preferably at least 20; more preferably, at least 40; more preferably yet, at least 60; and most preferably, at least 80. Thus, polynucleotides and polypeptides of the present invention comprise a 20-mer, a 40-mer, a 60-mer, an 80-mer, a 100-mer, a 120-mer, a 150-mer, a 180-mer, a 220-mer, a 250-mer, or a 300-mer, 400-mer,

500-mer or 600-mer of a polynucleotide or polypeptide identified as SEQ ID NOS: 1-908, and variants thereof.

Polynucleotide probes and primers complementary to and/or corresponding to SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, and variants of those sequences, are also comprehended by the present invention. Such oligonucleotide probes and primers are substantially complementary to the polynucleotide of interest. As used herein, the term "oligonucleotide" refers to a relatively short segment of a polynucleotide sequence, generally comprising between 6 and 60 nucleotides, and comprehends both probes for use in hybridization assays and primers for use in the amplification of DNA by polymerase chain reaction.

An oligonucleotide probe or primer is described as "corresponding to" a polynucleotide of the present invention, including one of the sequences set out as SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, or a variant, if the oligonucleotide probe or primer, or its complement, is contained within one of the sequences set out as SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908, or a variant of one of the specified sequences.

Two single stranded sequences are said to be substantially complementary when the nucleotides of one strand, optimally aligned and compared, with the appropriate nucleotide insertions and/or deletions, pair with at least 80%, preferably at least 90% to 95%, and more preferably at least 98% to 100%, of the nucleotides of the other strand. Alternatively, substantial complementarity exists when a first DNA strand will selectively hybridize to a second DNA strand under stringent hybridization conditions. Stringent hybridization conditions for determining complementarity include salt conditions of less than about 1 M, more usually less than about 500 mM, and preferably less than about 200 mM. Hybridization temperatures can be as low as 5°C, but are generally greater than about 22°C, more preferably greater than about 30°C, and most preferably greater than about 37°C. Longer DNA fragments may require higher hybridization temperatures for specific hybridization. Since the stringency of hybridization may be affected by other factors such as probe composition, presence of organic solvents and extent of base mismatching, the combination of parameters is more important than the absolute measure of any one alone. The DNA from plants or

samples or products containing plant material can be either genomic DNA or DNA derived by preparing cDNA from the RNA present in the sample.

In addition to DNA-DNA hybridization, DNA-RNA or RNA-RNA hybridization assays are also possible. In the first case, the mRNA from expressed genes would then be detected instead of genomic DNA or cDNA derived from mRNA of the sample. In the second case, RNA probes could be used. In addition, artificial analogs of DNA hybridizing specifically to target sequences could also be used.

In specific embodiments, the oligonucleotide probes and/or primers comprise at least about 6 contiguous residues, more preferably at least about 10 contiguous residues, and most preferably at least about 20 contiguous residues complementary to a polynucleotide sequence of the present invention. Probes and primers of the present invention may be from about 8 to 100 base pairs in length or, preferably from about 10 to 50 base pairs in length or, more preferably from about 15 to 40 base pairs in length. The probes can be easily selected using procedures well known in the art, taking into account DNA-DNA hybridization stringencies, annealing and melting temperatures, and potential for formation of loops and other factors, which are well known in the art. Tools and software suitable for designing probes, and especially suitable for designing PCR primers, are available on the Internet, for example, at URL http://www.horizonpress.com/pcr/. Preferred techniques for designing PCR primers are also disclosed in Dieffenbach CW and Dyksler GS, *PCR primer: a laboratory manual*, CSHL Press: Cold Spring Harbor, NY, 1995.

A plurality of oligonucleotide probes or primers corresponding to a polynucleotide of the present invention may be provided in a kit form. Such kits generally comprise multiple DNA or oligonucleotide probes, each probe being specific for a polynucleotide sequence. Kits of the present invention may comprise one or more probes or primers corresponding to a polynucleotide of the present invention, including a polynucleotide sequence identified in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908.

In one embodiment, the present invention provides genetic that include an open reading frame coding for at least a functional portion of a polypeptide encoded by a polynucleotide of the present invention or a variant thereof. As used herein, the "functional portion" of a polypeptide is that portion which contains the active site essential for affecting the metabolic step, *i.e.*, the portion of the molecule that is capable of binding one or more

reactants or is capable of improving or regulating the rate of reaction. The functional portion can be determined by targeted mutagenesis and screening of modified protein products with protocols well known in the art. Normally, the functional portion is 10-20 amino acids, but can be shorter or longer. The active site may be made up of separate portions present on one or more polypeptide chains and will generally exhibit high substrate specificity. The term "polypeptide encoded by a polynucleotide" as used herein, includes polypeptides encoded by a nucleotide sequence which includes the partial isolated DNA sequences of the present invention.

The open reading frame may be inserted in the genetic construct in a sense or antisense orientation, such that transformation of a target plant with the genetic construct will produce a change in the amount or structure of the polypeptide compared to the wild-type plant. Transformation with a genetic construct comprising an open reading frame in a sense orientation will generally result in modified expression of the selected gene, while transformation with a genetic construct comprising an open reading frame in an antisense orientation also generally results in modified expression of the selected gene. A population of plants transformed with a genetic construct comprising an open reading frame of the present invention in either a sense or antisense orientation may be screened for increased or reduced expression of the gene in question using techniques well known to those of skill in the art, and plants having the desired phenotypes may thus be isolated.

Alternatively, expression of a gene involved in the biosynthesis of polysaccharides may be inhibited by inserting a portion of an open reading frame of the present invention, in either sense or antisense orientation, in the genetic construct. Such portions need not be full-length but preferably comprise at least 25 and more preferably at least 50 residues of a polynucleotide of the present invention. A much longer portion or even the full length polynucleotide corresponding to the complete open reading frame may be employed. The portion of the open reading frame does not need to be precisely the same as the endogenous sequence, provided that there is sufficient sequence similarity to achieve inhibition of the target gene. Thus a sequence derived from one species may be used to inhibit expression of a gene in a different species.

In a second embodiment, the inventive genetic constructs comprise a polynucleotide including a non-coding region of a gene coding for a polypeptide encoded by a polynucleotide

of the present invention, or a polynucleotide sequence complementary to such a non-coding region. Examples of non-coding regions which may be usefully employed in such constructs include introns and 5'-non-coding leader sequences. Transformation of a target plant with such a genetic construct may lead to a reduction in the amount of polysaccharide synthesized by the plant by the process of co-suppression, in a manner similar to that discussed, for example, by Napoli et al. (*Plant Cell* 2:279-290, 1990) and de Carvalho Niebel et al. (*Plant Cell* 7:347-358, 1995).

Alternatively, regulation of polysaccharide synthesis can be achieved by inserting appropriate sequences or subsequences (*e.g.*, DNA or RNA) in ribozyme constructs (McIntyre CL, Manners JM, *Transgenic Res.* 5(4):257-262, 1996). Ribozymes are synthetic RNA molecules that comprise a hybridizing region complementary to two regions, each of which comprises at least 5 contiguous nucleotides in a mRNA molecule encoded by one of the inventive polynucleotides. Ribozymes possess highly specific endonuclease activity, which autocatalytically cleaves the mRNA.

The genetic constructs of the present invention further comprise a gene promoter sequence and a gene termination sequence, operably linked to the DNA sequence to be transcribed, which control expression of the gene. The gene promoter sequence is generally positioned at the 5' end of the DNA sequence to be transcribed, and is employed to initiate transcription of the DNA sequence. Gene promoter sequences are generally found in the 5' non-coding region of a gene but they may exist downstream of the open reading frame, in introns (Luehrsen KR, *Mol. Gen. Genet. 225*:81-93, 1991) or in the coding region, as for example in a plant defence gene (Douglas et al., *EMBO J. 10*:1767-1775, 1991). When the construct includes an open reading frame in a sense orientation, the gene promoter sequence also initiates translation of the open reading frame. For DNA constructs comprising either an open reading frame in an antisense orientation or a non-coding region, the gene promoter sequence consists only of a transcription initiation site having a RNA polymerase binding site.

A variety of gene promoter sequences which may be usefully employed in the DNA constructs of the present invention are well known in the art. The gene promoter sequence, and also the gene termination sequence, may be endogenous to the target plant host or may be exogenous, provided the promoter is functional in the target host. For example, the promoter and termination sequences may be from other plant species, plant viruses, bacterial plasmids,

and the like. Preferably, gene promoter and termination sequences are from the inventive sequences themselves.

Factors influencing the choice of promoter include the desired tissue specificity of the construct, and the timing of transcription and translation. For example, constitutive promoters, such as the 35S Cauliflower Mosaic Virus (CaMV 35S) promoter, will affect the activity of the enzyme in all parts of the plant. Use of a tissue specific promoter will result in production of the desired sense or antisense RNA only in the tissue of interest. With genetic constructs employing inducible gene promoter sequences, the rate of RNA polymerase binding and initiation can be modulated by external stimuli, such as light, heat, anaerobic stress, alteration in nutrient conditions and the like. Temporally regulated promoters can be employed to effect modulation of the rate of RNA polymerase binding and initiation at a specific time during development of a transformed cell. Preferably, the original promoters from the enzyme gene in question, or promoters from a specific tissue-targeted gene in the organism to be transformed, such as eucalyptus or pine are used. Other examples of gene promoters which may be usefully employed in the present invention include mannopine synthase (mas), octopine synthase (ocs), and those reviewed by Chua et al. (*Science* 244:174-181, 1989).

The gene termination sequence, which is located 3' to the DNA sequence to be transcribed, may come from the same gene as the gene promoter sequence or may be from a different gene. Many gene termination sequences known in the art may be usefully employed in the present invention, such as the 3' end of the *Agrobacterium tumefaciens* nopaline synthase gene. However, preferred gene terminator sequences are those from the original enzyme gene or from the target species to be transformed.

The genetic constructs of the present invention may also contain a selection marker that is effective in plant cells, to allow for the detection of transformed cells containing the inventive construct. Such markers, which are well known in the art, typically confer resistance to one or more toxins. One example of such a marker is the NPTII gene whose expression results in resistance to kanamycin or hygromycin, antibiotics which are usually toxic to plant cells at a moderate concentration (Rogers et al., *in* Weissbach, A and H, eds., *Methods for Plant Molecular Biology*, Academic Press Inc.: San Diego, CA, 1988). Transformed cells can thus be identified by their ability to grow in media containing the

antibiotic in question. Alternatively, the presence of the desired construct in transformed cells can be determined by means of other techniques well known in the art, such as Southern and Western blots.

A transcription initiation site is additionally included in the genetic construct when the sequence to be transcribed lacks such a site.

Techniques for operatively linking the components of the inventive genetic constructs are well known in the art and include the use of synthetic linkers containing one or more restriction endonuclease sites as described, for example, by Sambrook et al. (*Molecular cloning: a laboratory manual*, CSHL Press: Cold Spring Harbor, NY, 1989). The genetic construct of the present invention may be linked to a vector having at least one replication system, for example *E. coli*, whereby after each manipulation, the resulting construct can be cloned and sequenced and the correctness of the manipulation determined.

The genetic constructs of the present invention may be used to transform a variety of plants, both monocotyledonous (*e.g.*, grasses, corn, grains, oat, wheat and barley), dicotyledonous (*e.g.*, *Arabidopsis*, tobacco, legumes, alfalfa, oaks, eucalyptus, maple), and Gymnosperms (*e.g.*, Scots pine; *see* Aronen, *Finnish Forest Res. Papers*, Vol. 595, 1996), white spruce (Ellis et al., *Biotechnology* 11:84-89, 1993), and larch (Huang et al., *In Vitro Cell* 27:201-207, 1991). In a preferred embodiment, the inventive genetic constructs are employed to transform woody plants, herein defined as a tree or shrub whose stem lives for a number of years and increases in diameter each year by the addition of woody tissue. Preferably the target plant is selected from the group consisting of eucalyptus and pine species, most preferably from the group consisting of *Eucalyptus grandis* and *Pinus radiata*. Other species which may be usefully transformed with the DNA constructs of the present invention include, but are not limited to: pines such as *Pinus banksiana, Pinus brutia, Pinus caribaea, Pinus clausa, Pinus contorta, Pinus coulteri, Pinus echinata, Pinus eldarica, Pinus ellioti, Pinus jeffreyi, Pinus lambertiana, Pinus monticola, Pinus nigra, Pinus palustrus, Pinus pinaster, Pinus ponderosa, Pinus resinosa, Pinus rigida, Pinus serotina, Pinus strobus, Pinus sylvestris, Pinus taeda, Pinus virginiana*; other gymnosperms, such as *Abies amabilis, Abies balsamea, Abies concolor, Abies grandis, Abies lasiocarpa, Abies magnifica, Abies procera, Chamaecyparis lawsoniona, Chamaecyparis nootkatensis, Chamaecyparis thyoides, Huniperus virginiana, Larix decidua, Larix laricina, Larix leptolepis, Larix occidentalis,*

Larix siberica, Libocedrus decurrens, Picea abies, Picea engelmanni, Picea glauca, Picea mariana, Picea pungens, Picea rubens, Picea sitchensis, Pseudotsuga menziesii, Sequoia gigantea, Sequoia sempervirens, Taxodium distichum, Tsuga canadensis, Tsuga heterophylla, Tsuga mertensiana, Thuja occidentalis, Thuja plicata; and Eucalypts, such as *Eucalyptus alba, Eucalyptus bancroftii, Eucalyptus botyroides, Eucalyptus bridgesiana, Eucalyptus calophylla, Eucalyptus camaldulensis, Eucalyptus citriodora, Eucalyptus cladocalyx, Eucalyptus coccifera, Eucalyptus curtisii, Eucalyptus dalrympleana, Eucalyptus deglupta, Eucalyptus delagatensis, Eucalyptus diversicolor, Eucalyptus dunnii, Eucalyptus ficifolia, Eucalyptus globulus, Eucalyptus gomphocephala, Eucalyptus gunnii, Eucalyptus henryi, Eucalyptus laevopinea, Eucalyptus macarthurii, Eucalyptus macrorhyncha, Eucalyptus maculata, Eucalyptus marginata, Eucalyptus megacarpa, Eucalyptus melliodora, Eucalyptus nicholii, Eucalyptus nitens, Eucalyptus nova-anglica, Eucalyptus obliqua, Eucalyptus obtusiflora, Eucalyptus oreades, Eucalyptus pauciflora, Eucalyptus polybractea, Eucalyptus regnans, Eucalyptus resinifera, Eucalyptus robusta, Eucalyptus rudis, Eucalyptus saligna, Eucalyptus sideroxylon, Eucalyptus stuartiana, Eucalyptus tereticornis, Eucalyptus torelliana, Eucalyptus urnigera, Eucalyptus urophylla, Eucalyptus viminalis, Eucalyptus viridis, Eucalyptus wandoo* and *Eucalyptus youmanni*; together with hybrids of the above species.

As discussed above, transformation of a plant with a genetic construct of the present invention will result in a modification in polysaccharide synthesis in the plant. For example, an increase in the production of cellulose in a plant may be obtained by introducing a genetic construct comprising an open reading frame encoding the enzyme CEL in a sense orientation. Similarly, transformation of a plant with a genetic construct comprising either an open reading frame encoding CEL in an antisense orientation or a non-coding (untranslated) region of a CEL gene will lead to a reduction in the cellulose content of the transformed plant.

Techniques for stably incorporating genetic constructs into the genome of target plants are well known in the art and include *Agrobacterium tumefaciens* mediated introduction, electroporation, protoplast fusion, injection into reproductive organs, injection into immature embryos, high velocity projectile introduction and the like. The choice of technique will depend upon the target plant to be transformed. For example, dicotyledonous plants and certain monocots and gymnosperms may be transformed by *Agrobacterium* Ti plasmid

technology, as described, for example by Bevan (*Nucleic Acids Res.* 12:8711-8721, 1984). Targets for the introduction of the genetic constructs of the present invention include tissues, such as leaf tissue, disseminated cells, protoplasts, seeds, embryos, meristematic regions; cotyledons, hypocotyls, and the like. The preferred method for transforming eucalyptus and pine is a biolistic method using pollen (*see*, for example, Aronen, *Finnish Forest Res. Papers*, 595:53, 1996) or easily regenerable embryonic tissues.

Once the cells are transformed, cells having the inventive genetic construct incorporated in their genome may be selected by means of a marker, such as the kanamycin resistance marker discussed above. Transgenic cells may then be cultured in an appropriate medium to regenerate whole plants, using techniques well known in the art. In the case of protoplasts, the cell wall is allowed to reform under appropriate osmotic conditions. In the case of seeds or embryos, an appropriate germination or callus initiation medium is employed. For explants, an appropriate regeneration medium is used. Regeneration of plants is well established for many species. For a review of regeneration of forest trees, *see* Dunstan et al., "Somatic embryogenesis in woody plants," *in* Thorpe TA, ed., *In vitro embryogenesis of plants,* (Current Plant Science and Biotechnology in Agriculture), Vol. 20, Chapter 12, pp. 471-540, 1995. Specific protocols for the regeneration of spruce are discussed by Roberts et al., ("Somatic embryogenesis of spruce," *in* Redenbaugh K, ed., *Synseed: applications of synthetic seed to crop improvement,* Chapter 23, pp. 427-449, CRC Press: [n.p.], 1993). The resulting transformed plants may be reproduced sexually or asexually, using methods well known in the art, to give successive generations of transgenic plants.

As discussed above, the production of RNA in target plant cells can be controlled by choice of the promoter sequence, or by selecting the number of functional copies or the site of integration of the polynucleotides incorporated into the genome of the target plant host. A target plant may be transformed with more than one genetic construct of the present invention, thereby modulating the activity of more than one cell wall polysaccharide enzyme, affecting enzyme activity in more than one tissue, or affecting enzyme activity at more than one expression time. Similarly, a genetic construct may be assembled containing more than one open reading frame coding for a polypeptide encoded by a polynucleotide of the present invention or more than one non-coding region of a gene coding for such a polypeptide. The polynucleotides of the present inventive may also be employed in combination with other

known sequences encoding polypeptides involved in the synthesis of cell wall polysaccharides. In this manner, it may be possible to modify a biosynthetic pathway of cell wall polysaccharides in a non-woody plant to produce a new type of woody plant.

The following examples are offered by way of illustration and not by way of limitation.

Example 1

Isolation and Characterization of cDNA Clones from *Eucalyptus grandis*

Eucalyptus grandis cDNA expression libraries (from various tissues, including flowers, leaves, phloem, roots, seeds, shoot buds and xylem) were constructed and screened as follows.

mRNA was extracted from the plant tissue using the protocol of Chang et al. *(Plant Molecular Biology Reporter* 11:113-116, 1993) with minor modifications. Specifically, samples were dissolved in CPC-RNAXB (100 mM Tris-Cl, pH 8,0; 25 mM EDTA; 2.0 M NaCl; 2%CTAB; 2% PVP and 0.05% Spermidine*3HCl) and extracted with chloroform:isoamyl alcohol, 24:1. mRNA was precipitated with ethanol and the total RNA preparate was purified using a Poly(A) Quik mRNA Isolation Kit (Stratagene, La Jolla, CA). A cDNA expression library was constructed from the purified mRNA by reverse transcriptase synthesis followed by insertion of the resulting cDNA clones in Lambda ZAP using a ZAP Express cDNA Synthesis Kit (Stratagene), according to the manufacturer's protocol. The resulting cDNAs were packaged using a Gigapack II Packaging Extract (Stratagene) employing 1 μl of sample DNA from the 5 μl ligation mix. Mass excision of the library was done using XL1-Blue MRF' cells and XLOLR cells (Stratagene) with ExAssist helper phage (Stratagene). The excised phagemids were diluted with NZY broth (Gibco BRL, Gaithersburg, MD) and plated out onto LB-kanamycin agar plates containing X-gal and isopropylthio-beta-galactoside (IPTG).

Of the colonies plated and picked for DNA miniprep, 99% contained an insert suitable for sequencing. Positive colonies were cultured in NZY broth with kanamycin and cDNA was purified by means of alkaline lysis and polyethylene glycol (PEG) precipitation. Agarose gel at 1% was used to screen sequencing templates for chromosomal contamination. Dye primer

sequences were prepared using a Turbo Catalyst 800 machine (Perkin Elmer/Applied Biosystems Division, Foster City, CA) according to the manufacturer's protocol.

DNA sequences for positive clones were obtained using a Perkin Elmer/Applied Biosystems Division Prism 377 sequencer. cDNA clones were sequenced first from the 5' end and, in some cases, also from the 3' end. For some clones, internal sequence was obtained using subcloned fragments. Subcloning was performed using standard procedures of restriction mapping and subcloning to pBluescript II SK+ vector.

The determined cDNA sequences are provided in SEQ ID NO: 2, 3, 6, 7, 9, 12-15, 18, 19, 21, 23, 26, 28, 29, 57, 58, 60-66, 71-73, 78, 79, 105, 107, 119-128, 139, 141, 142, 149-161, 186-195, 197, 198, 205-233, 252-256, 264, 273-293, 319-330, 366, 373-377, 382-385, 390-393, 399-434, 479-503, 507-512, 522-528, 531-547, 552-554, 556-573, 587-589, 592-612 and 621-771.

Example 2

Isolation and Characterization of cDNA Clones from *Pinus radiata*

Isolation of cDNA clones by high through-put screening

Pinus radiata cDNA expression libraries (from various tissues, including cell cultures, fascicle meristems, phloem, pollen sacs, roots, seedlings, shoot buds, strobilus and xylem) were constructed and screened as described above in Example 1. DNA sequence for positive clones was obtained using forward and reverse primers on a Perkin Elmer/Applied Biosystems Division Prism 377 sequencer. The determined cDNA sequences are provided in SEQ ID NO: 1, 4, 5, 8, 10, 11, 16, 17, 20, 22, 24, 25, 27, 59, 67-70, 74-77, 80, 109-113, 140, 143, 162-185, 196, 199-204, 234-251, 257-263, 265-272, 294-318, 331-365, 367-372, 378-381, 386-389, 394-398, 435-481, 504-506, 513-521, 529, 530, 548-551, 555, 574-586, 590, 591, 613-620 and 772-908.

Example 3

Polynucleotide and Amino Acid Analysis

The determined cDNA sequences described above were compared to and aligned with known sequences in the EMBL database (as updated to May 1999). Specifically, the

polynucleotides identified in SEQ ID NO: 1-29, 57-80, 105, 107, 109-111, 115-125, 135-139 and 145-904 were compared to polynucleotides in the EMBL database using the BLASTN algorithm Version 2.0.6 [Sep-16-1998] set to the following running parameters: Unix running command: blastall –p blastn –d embldb –e 10 –G0 –E0 –r1 –v30 –b30 –i queryseq –o results. Multiple alignments of redundant sequences were used to build up reliable consensus sequences. Based on similarity to known sequences from other plant or non-plant species, the isolated polynucleotides of the present invention identified as SEQ ID NO: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908 were putatively identified as encoding the enzymes shown in Table 1, above.

The cDNA sequences of SEQ ID NO: 58, 60, 62, 64, 65, 67-70, 72, 74, 75, 77, 78, 80, 105, 107, 119-121, 123-128 and 139-143 were determined to have less than 40% identity to sequences in the EMBL database using the computer algorithm BLASTN, as described above. The cDNA sequences of SEQ ID NO: 57, 59, 66, 79 and 122 were determined to have less than 60% identity to sequences in the EMBL database using BLASTN, as described above. The cDNA sequences of SEQ ID NO: 61, 71, 73 and 76 were determined to have less than 75% identity to sequences in the EMBL database using BLASTN, as described above. The cDNA sequence of SEQ ID NO: 63 was determined to have less than 90% identity to sequences in the EMBL database using BLASTN, as described above.

Example 4

Functional Identification of Cellulose Biosynthetic Genes

Sense constructs containing sequences including the coding regions for UGP (SEQ ID NO: 23) and SUS (SEQ ID NO: 49) from *Eucalyptus grandis*, and UGP (SEQ ID NO: 24) from *Pinus radiata* were inserted into the expression vector pET16b (Clontech Laboratories Inc, Palo Alto, CA). The resulting constructs were transformed into *E. coli* XL1-Blue (Stratagene) and induced to produce recombinant protein by the addition of IPTG. Purified proteins were obtained using Ni^{2+} column chromatography (Janknecht et al., *Proc. Natl. Acad. Sci. USA*, 88:8972-8976, 1991). Enzyme assays for each of the purified proteins demonstrated the expected substrate specificity and enzymatic activity for the genes tested.

Enzyme assays for UGP were performed using published methods (Peng and Chang, *FEBS Lett.* 329[1,2]:153-158, 1993). The data shown in Table 2 demonstrates enzyme

activity for the expressed proteins as compared to data from Katsube et al. (*Biochem.* 30:8546-8551, 1991) and Nakano et al. (*J. Biochem.* 106:528-532, 1989).

TABLE 2

SEQ ID NO:	24	23	Katsube et al.	Nakano et al.
Species	*P. radiata*	*E: grandis*	*S. tuberosum*	*S. tuberosum*
Enzyme	UGP	UGP	UGP	UGP
K_M^{G1P}	0.121	0.126	0.130	0.180
SEM	0.020	0.002	n.a.	n.a.
K_M^{UTP}	0.091	not done	0.076	0.170
SEM	0.015	not done	n.a.	n.a.
K_M^{ATP}	no activity	no activity	no activity	no activity

Enzyme assays for SUS (sucrose synthase) were performed using the methods described by Šebková, V. et al. (*Plant Physiol.*, 108:75-83, 1995). The data shown in Table 3 demonstrates enzyme activity for the expressed proteins. The $K_M^{Sucrose}$ of *E. grandis* is compared with the data reported by Delmer DP (*J. Biol. Chem.* 247:3822-3828, 1972) and Nakai et al.(*BioSci. Biotech. Biochem.* 61:1500-1503).

TABLE 3

SEQ ID NO:	49	Delmer et al.	Nakai et al.
Species	*E. grandis*	*V. radiata*	*V. radiata*
Enzyme	SUS	SUS	SUS
$K_M^{Sucrose}$	1.651	16.700	161.000
SEM	0.371	n.a.	n.a.
K_M^{UDP}	0.028	n.a.	n.a.
SEM	0.003	n.a.	n.a.

A sense construct containing the sequence of the coding region for cellulose synthase (CEL; SEQ ID NO: 50) from *Eucalyptus grandis* was inserted into the protein expression vector pcDNA3 (Invitrogen, Carlsbad, CA). The resulting construct was transfected into mammalian 293T cells (DuBridge RB et al., *Mol. Cell. Biol.* 7[1]:379-387, 1987), and recombinant protein was induced by the addition of IPTG. Proteins were solubilised from membranes, and the level of CEL activity was determined as described by Kudlicka K and Brown RM Jr. (*Plant Phys.* 115:643-656, 1997). As a positive control for activity, native CEL enzyme was solubilised from mung bean (*Vigna radiata*) plants. The determined levels of CEL activity for *V. radiata* are shown in Fig. 1. The levels of CEL activity found in mammalian 293T cells transfected with the *Eucalyptus* CEL expression clone were found to be similar to those obtained from *V. radiata* (Fig. 2). CEL activity was absent in non-transfected control 293T cells.

Example 5

Use of a Cellulose Synthase (CEL) Gene to Modify Polysaccharide Biosynthesis

Transformation of tobacco plants with a *Pinus radiata* CEL gene is performed as follows. Genetic constructs comprising sense and anti-sense constructs containing a polynucleotide including the coding region of CEL (SEQ ID NO: 8) from *Pinus radiata* are constructed and inserted into *Agrobacterium tumefaciens* by direct transformation using published methods (*See*, An G, Ebert PR, Mitra A, Ha SB, "Binary Vectors," *in* Gelvin SB and Schilperoort RA, eds., *Plant Molecular Biology Manual*, Kluwer Academic Publishers: Dordrecht, 1988). The constructs of sense polynucleotides are made by cloning PBK-CMV plasmid cDNA inserts into pART7 plasmids, followed by cloning of the *Not*I-digested 35S-Insert-OCS 3'UTR-fragments from the pART7 vectors into pART27 plant expression vectors (*See* Gleave A, "A versatile binary vector system with a T-DNA organizational structure conducive to efficient integration of cloned DNA into the plant genome," *Plant Molecular Biology* 20:1203-1207, 1992). The presence and integrity of the transgenic constructs are verified by restriction digestion and DNA sequencing.

Tobacco (*Nicotiana tabacum* cv. Samsun) leaf sections are transformed with the sense and anti-sense CEL constructs using the method of Horsch et al. (*Science* 227:1229-1231,

1985). Transformed plants containing the appropriate CEL construct are verified using Southern blot experiments. Expression of *Pinus* CEL in transformed plants is confirmed by isolating total RNA from each independent transformed plant line created with the CEL sense and anti-sense constructs. The RNA samples are analysed in Northern blot experiments to determine the level of expression of the transgene in each transformed line.

The total activity of CEL enzyme, encoded by the *Pinus* CEL gene and by the endogenous tobacco CEL gene, is analysed for each transformed plant line created with the CEL sense and anti-sense constructs. Crude protein extracts are prepared from each transformed plant and assayed using the methods of Robertson et al. (*Biochem J.* 306:745-750, 1995) and Pear et al. (*Proc. Natl. Acad. Sci. USA* 93:12637-12642, 1996).

The concentration of cellulose in the transformed tobacco plants is determined using the method of Smith and Harris (*Plant Phys.* 107:1399-1409, 1995). Briefly, whole tobacco plants, of an average age of 38 days, are frozen in liquid nitrogen and ground to a fine powder in a mortar and pestle. The cellulose content of 100 mg of frozen powder from an empty vector-transformed control plant line, at least one independent transformed plant line containing the sense construct for CEL and at least one independent transformed plant lines containing the anti-sense construct for CEL are determined using a glucan estimation kit from Megazyme (Warriewood, New South Wales, Australia) using the protocols supplied by the manufacturer.

SEQ ID NOS: 1-908 are set out in the attached Sequence Listing. The codes for nucleotide and amino acid sequences used in the attached Sequence Listing, including the symbols "n" and "Xaa", conform to WIPO Standard ST.25 (1998), Appendix 2, Table 1.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, changes and modifications can be carried out without departing from the scope of the invention which is intended to be limited only by the scope of the claims.

Claims:

1. An isolated polynucleotide comprising a nucleotide sequence selected from the group consisting of: (1) sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; (2) complements of the sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; (3) reverse complements of the sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; (4) reverse sequences of the sequences recited in SEQ ID NOS: 1-29, 57-80, 105, 107, 109-113, 119-129, 139-143 and 149-908; (5) nucleotide sequences producing an Expectation ("E") value of 0.01 or less when compared to a sequence recited in (1) – (4) above; (6) nucleotide sequences having at least 50% identity to a nucleotide sequence recited in (1) – (4) above; (7) nucleotide sequences that hybridize to a sequence recited in (1) – (4) above under stringent hybridization conditions; (8) nucleotide sequences that are 200-mers of a sequence recited in (1) – (4) above; (9) nucleotide sequences that are 100-mers of a sequence recited in (1) – (4) above; (10) nucleotide sequences that are 40-mers of a sequence recited in (1) – (4) above; (11) nucleotide sequences that are 20-mers of a sequence recited in (1) – (4) above; (12) nucleotide sequences that are degeneratively equivalent to a sequence recited in (1) – (4) above; and (13) nucleotide sequences that are allelic variants of a sequence recited in (1) – (4) above.
2. An isolated oligonucleotide probe or primer comprising at least 10 contiguous residues complementary to 10 contiguous residues of a nucleotide sequence recited in claim 1.
3. A kit comprising a plurality of oligonucleotide probes or primers of claim 2.
4. A storage medium having recorded thereon a plurality of polynucleotides, at least one of the polynucleotides comprising a nucleotide sequence recited in claims 1 or 2.
5. A construct comprising a polynucleotide of claim 1.
6. A transgenic cell comprising a construct according to claim 5.
7. A construct comprising, in the 5'-3' direction:
   (a) a gene promoter sequence;
   (b) a polynucleotide sequence comprising at least one of the following: (1) a polynucleotide coding for at least a functional portion of a polypeptide

encoded by a nucleotide sequence of claim 1; and (2) a polynucleotide comprising a non-coding region of a gene coding for a polypeptide encoded by a nucleotide sequence selected from the group consisting of sequences recited in claim 1; and

(c) a gene termination sequence.

8. The construct of claim 7, wherein the polynucleotide is in a sense orientation.

9. The construct of claim 7, wherein the polynucleotide is in an antisense orientation.

10. The construct of claim 7, wherein the gene promoter sequence is functional in a plant host to provide for transcription in xylem.

11. A transgenic plant cell comprising a construct of claim 7.

12. A plant comprising a transgenic plant cell according to claim 11, or a part or propagule or progeny thereof.

13. A method for modulating one or more of the polysaccharide content, the polysaccharide composition and the polysaccharide structure of a plant, comprising stably incorporating into the genome of the plant a polynucleotide of claim 1.

14. The method of claim 13 wherein the plant is selected from the group consisting of eucalyptus and pine species.

15. The method of claim 13 comprising stably incorporating into the genome of the plant a construct of claim 7.

16. A method for producing a plant having one or more of altered polysaccharide content, altered polysaccharide composition and altered polysaccharide structure, comprising:

(a) transforming a plant cell with a construct of claim 7 to provide a transgenic cell; and

(b) cultivating the transgenic cell under conditions conducive to regeneration and mature plant growth.

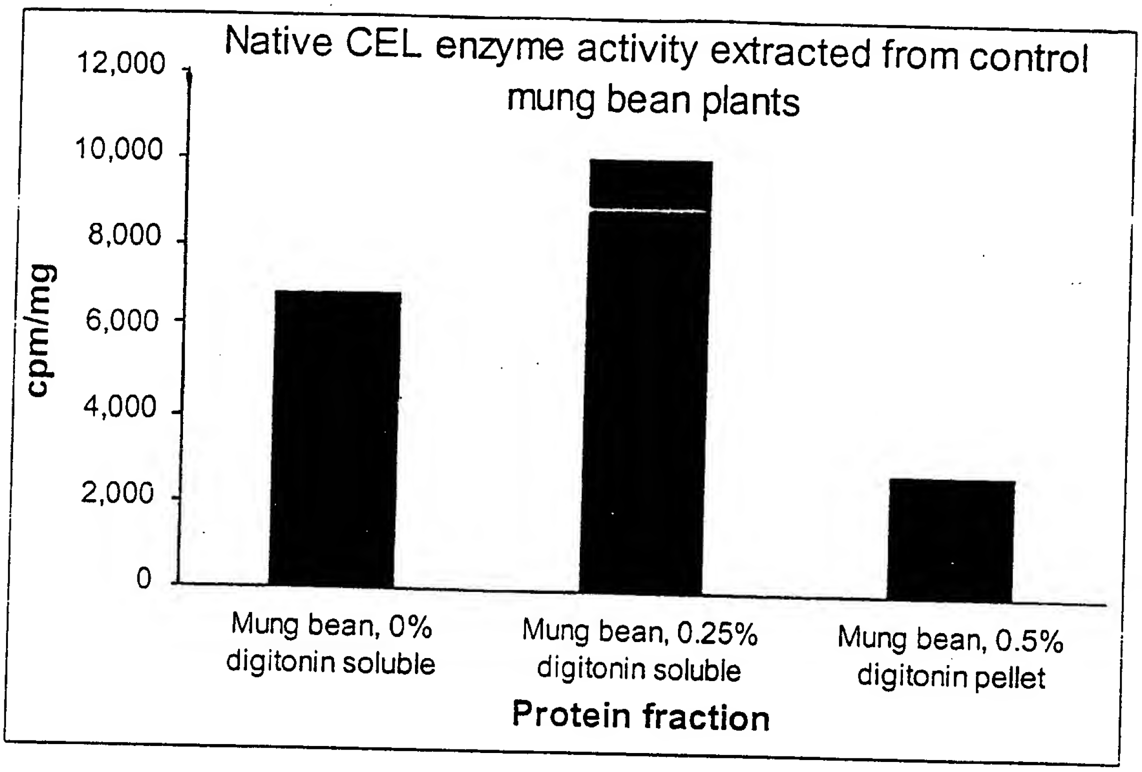
17. A method for modifying the activity of a polypeptide involved in a polysaccharide biosynthetic pathway in a plant comprising stably incorporating into the genome of the plant a construct of claim 7.

18. An isolated polypeptide comprising an amino acid sequence selected from the group consisting of: (a) sequences of SEQ ID NOS: 30-56, 81-104, 106, 108, 114-118, 129-138 and 144-148; (b) sequences having at least 50% identity to a sequence of (a);

sequences having at least 70% identity to a sequence of (a); and sequences having at least 90% identity to a sequence of (a).

19. An isolated polypeptide encoded by an isolated polynucleotide sequence of claim 1.

Figure 1



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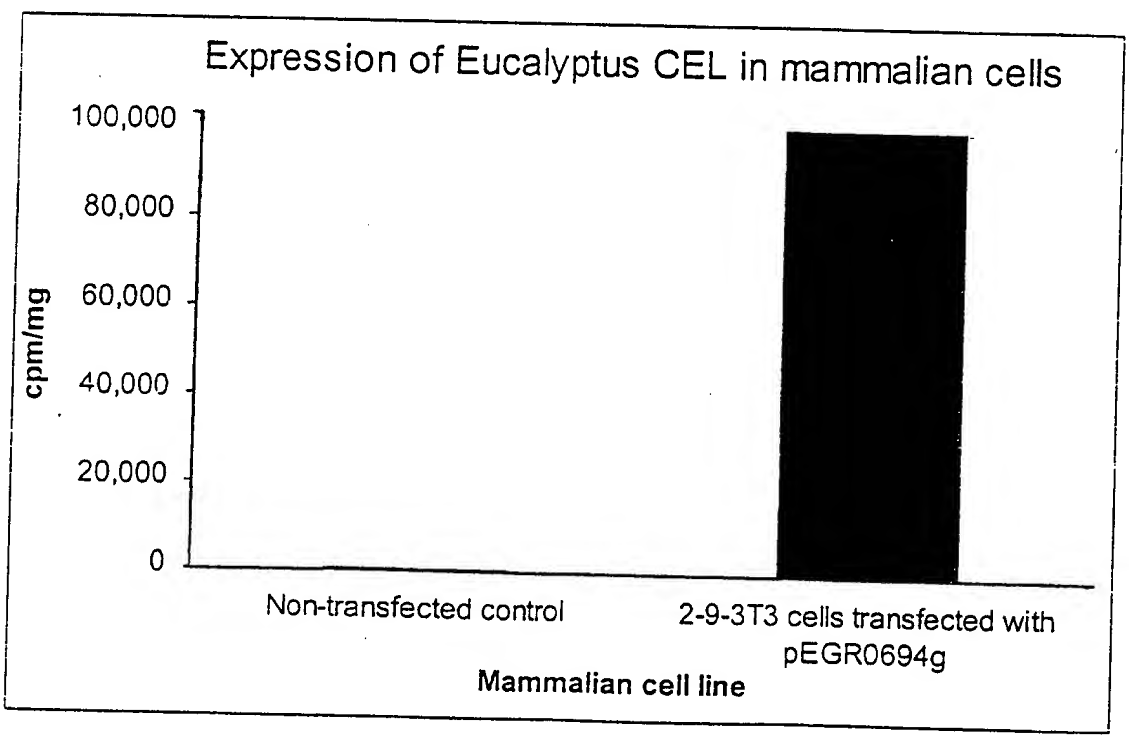

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<210> 16
<211> 401
<212> DNA
<213> Pinus radiata

<400> 16
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accaaatacc cagattcaga catatattgg aaaaattttg a 401

<210> 17
<211> 477
<212> DNA
<213> Pinus radiata

<400> 17
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tgatattgac ccatcaaagt ccaaagacag agaagaagtg gccgaaattg aaaaaatgca 360
tagactagtt aaagagtata acctgaatgg tcagttcaga tggatatgtg cacaaaagaa 420
tagagtgcgg aatggtgagc tttaccgcta catctgtgac accaggggtg cctttgt 477

<210> 18
<211> 503
<212> DNA
<213> Eucalyptus grandis

<400> 18
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<210> 19
<211> 413
<212> DNA
<213> Eucalyptus grandis

<400> 19
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<210> 20
<211> 1108
<212> DNA
<213> Pinus radiata

<400> 20
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aaagtttaaa cttaaaattg tgtatagc 1108

<210> 21
<211> 559
<212> DNA
<213> Eucalyptus grandis

<400> 21
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cagcgaccaa gagccttttg gacaaactcg ttgtgctgaa gctcaatggt ggtttgggaa 540
ctacgatggg ttgtactgg 559

<210> 22
<211> 1036
<212> DNA
<213> Pinus radiata

<400> 22
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tgaaaaaaaa aaaaaa 1036

<210> 23
<211> 467
<212> DNA
<213> Eucalyptus grandis

<400> 23
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ggattaggaa tgatctccat cttaagagct tgagcttcga caagcctttt aattgccttt 420
aagttaaccc acaagttgtt tgtattgaaa atcttgaact tctcaat 467

<210> 24
<211> 704
<212> DNA
<213> Pinus radiata

<400> 24
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gtgcgaagta tgtgatttgt cgagaagatg tcaacaatta tagtgccagt tccaataccg 180
accccatctg aagactctga acgcctgagg aaggcttttg aagggtgggg cacaaatgag 240
aagtcaatca tacaaatatt aggacataga actgcagcac aacgcaaagt aatccgtcaa 300
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gcaaagaagc taagtgaatc tataaccgag caaaaaagat aatt 704

<210> 25
<211> 712
<212> DNA

<213> Pinus radiata

<400> 25
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agggactgtg aggaaatcca tctcgcttgc aaaggtctgg gaagtgacga ggagaagata     180
atcgaaatac ttggaagcaa aaatgagcag cagcggaagg agataagaga aacctattat     240
gcaatgtata aggaagacct gtgcaagagg ctggagaagg agcttcatgg caaattagag     300
aaagccatcg tcttatggat gcacgagcca gctgaccggg acgctatcat tgctggaacc     360
gccctggaag gatggtgcac agatgatcgt gctctaatcg aagtgatttg cacaaggtcc     420
tccactcaaa tcgttaagat tcgtgaagct taccagaaac gatatcagag gtgcctcgat     480
gatgatgtta tttgcaaaac gaatggtccc tttcaaaagc tacttcttgc actgctcaaa     540
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ttgtacgaag cgggcgaagg acggtgtgga accgatgagg atacttttat ccgcatattt     660
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<210> 26
<211> 789
<212> DNA
<213> Eucalyptus grandis

<400> 26
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gccgagcagc tccaaaaagc tttcgcagga tgggggacga atgaagatct gatcatatcc     180
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<210> 27
<211> 2132
<212> DNA
<213> Pinus radiata

<400> 27
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atacggttca tatttttctc atgaatatca agatgctgtt gcagtttctg tgaaaaaaag     180
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gcctgaggaa ggcctttgaa ggctggggca caaatgagaa gttgattata gaaattttgg     420
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cctctggtca ctggatcccc cagaacgaga tgcactttta gcctatgaat cgataaagaa     600
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<210> 28
<211> 2588
<212> DNA
<213> Eucalyptus grandis

<400> 28

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ttgcttatgg caagacaagc atatcatgcc cgatacaaga agtcgctgga agaggacgtc   1800
ggtcaccaca caactggaga ttttcgtaag ttgctggtac ctcttgtgag ctcctaccgt   1860
tatgatggag atgaggtgaa tatgactttg gcaaaagcag aggctaagat actccacgag   1920
aagatctcag agaaggctta tggccatgag gatctcataa ggattttggc tactaggagc   1980
aaagcacagg tcaatgctac gctgaatcac tacaaaaatg agtttggaaa tgatatcaac   2040
aaggatttga aaactgatcc aaaagacgcg ttccttacta tactgagagc tacagtaaag   2100
tgcctgactc gccctgagaa gtattttgaa aaggttcttc gtctagccat caataagcga   2160
ggaacagatg aaggggctct gaccagagta gttgctacca gggccgaggt tgacatgaag   2220
tttataagtg aggagtacca gaggaggaat agcatccctc tcgatcgtgc cattgtcaag   2280
gacactactg gagactatga aaaaatgctt ctggcattga ttggccacgt cgaggcttga   2340
tttacaagta ctcatgaagc tatcctggtg gaggcaatat ctctgttttt ggtgtggttt   2400
gaggcatttc tattttcctt gctttccaac aacgtgtagt taccaacatg cctcccccagt  2460
tgtcagttgt agctatgcga agcaaataca cttcttataa tggcgttggt ttatgtactt   2520
atgagaagtc tttgattttg atctttaatc aagactgcta gtaagtgatc gtgaaaaaaa   2580
aaaaaaaa                                                            2588
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<210> 29
<211> 627
<212> DNA
<213> Eucalyptus grandis

<400> 29

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acaatgtcga actctcaccg tcccgcagcc actgccccct gtgagccgat gactgcgagc     60
agctccggaa agccttcgca ggatggggaa caaatgagaa gttgatcata tccatattgg    120
gccataggaa tgcggcgcag aggaagctga ttcggcaaac ctatgccgag acttacggcg    180
aggacctcct caaggcattg gacagagaac ttaccaatga tttcgaggtc tgatcttcct    240
ttaatttttt ggattcatcc catggaagac gtgtccttct ttctctcaga ttaatccata    300
ttcattccgt atcgtcagag gctggtggtc ctttggtcac ttgatccggc tgaacgtgat    360
gcgtacttgg cgaatgaagc gacgaaaaga tggacttcaa gcaaccaggt tctcatggaa    420
atagcctgca cgaggtctcc acagcagttg ctcatggcaa gacaagcata tcatgctcga    480
tacaagaagt cgctggaaga ggacgtcgct caccacacaa ctggagattt tcgtaagttg    540
ctggtacctc ttgtgagctc ctaccattat gatggagatg aggtgaatat gactttggca    600
aaagcagagg ctaagatact ccacgag                                        627
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<210> 30
<211> 151
<212> PRT
<213> Pinus radiata

<400> 30

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Phe Arg Gly Ile Gln Tyr Arg Arg Asn Gly Trp Arg Tyr Gly Arg Arg
1               5                   10                  15
Val Ala Asn Leu Asn Val Leu Gly Arg Glu Thr Ala Glu Phe Thr Ser
            20                  25                  30
Phe Arg Pro Val Phe Leu Arg Gly Asn Ser Gln Gly Leu Ser Ser Ala
        35                  40                  45
Ser Ser Leu Cys Asp Tyr Arg Ile Phe Ala Asp Ser Lys Arg Lys Lys
    50                  55                  60
His Ala Ile Phe Arg Lys Gln Asn Ile Asn Arg Ser Thr Val Val Ser
65                  70                  75                  80
Pro Arg Ala Val Ser Asp Thr Phe Ser Glu Leu Thr Cys Leu Asp Pro
                85                  90                  95
Val Ala Ser Arg Ser Val Leu Gly Ile Ile Leu Gly Gly Gly Ala Gly
            100                 105                 110
Thr Arg Leu Tyr Pro Leu Thr Lys Lys Arg Ala Lys Pro Ala Val Pro
        115                 120                 125
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Leu Gly Ala Asn Tyr Arg Leu Ile Asp Ile Pro Val Ser Asn Cys Ile
130 135 140
Asn Ser Asn Ile Ser Lys Ile
145 150

<210> 31
<211> 72
<212> PRT
<213> Eucalyptus grandis

<400> 31
Ala Pro Ala Leu Ala Ser Gly Ala Ala Ala Phe Lys Ser Val Arg Arg
1 5 10 15
Ala Pro Ala Val Val Ser Pro Arg Ala Val Ser Asp Ser Arg Asn Ser
20 25 30
Gln Thr Cys Leu Asp Pro Asp Ala Ser Arg Ser Val Leu Gly Ile Ile
35 40 45
Leu Gly Gly Gly Ala Gly Thr Arg Leu Tyr Pro Leu Thr Lys Lys Arg
50 55 60
Ala Lys Pro Ala Val Pro Leu Gly
65 70

<210> 32
<211> 124
<212> PRT
<213> Eucalyptus grandis

<400> 32
Leu Lys Asp Ala Ile Ile Ser His Gly Cys Phe Leu Arg Glu Cys Arg
1 5 10 15
Val Glu Arg Ser Ile Val Gly Glu Arg Ser Arg Leu Asp Ser Gly Val
20 25 30
Glu Leu Lys Asp Thr Val Met Met Gly Ala Asp Tyr Tyr Gln Thr Glu
35 40 45
Ser Glu Ile Ala Ser Leu Leu Ala Glu Gly Lys Val Pro Ile Gly Ile
50 55 60
Gly Lys Asn Thr Lys Ile Arg Asn Cys Ile Ile Asp Lys Asn Ala Lys
65 70 75 80
Ile Gly Lys Asp Val Ala Ile Val Asn Lys Asp Gly Val Glu Glu Ala
85 90 95
Asp Arg Pro Gly Asp Gly Phe Tyr Ile Arg Leu Gly Ile Thr Val Ile
100 105 110
Leu Glu Lys Ala Thr Ile Glu Asp Gly Thr Val Ile
115 120

<210> 33
<211> 67
<212> PRT
<213> Pinus radiata

<400> 33
Ile Arg Ile Val Leu Gln Gly Phe Asn Trp Glu Ser His Arg Ser Gly
1 5 10 15
Gly Trp Tyr His Lys Leu Ser Gly Lys Ala Ala Glu Ile Ala Ser Lys
20 25 30
Gly Phe Thr Ile Val Trp Leu Pro Pro Pro Thr Asp Ser Val Ser Pro
35 40 45

Glu Gly Tyr Met Pro Arg Asp Leu Tyr Asp Leu Asn Ser Arg Tyr Gly
50 55 60
Ser Leu Glu
65

<210> 34
<211> 157
<212> PRT
<213> Pinus radiata

<400> 34
Asn Gln Asp Ala His Arg Gln Arg Ile Val Asn Trp Ile Asn Ala Thr
1 5 10 15
Gly Gly Ser Ser Ser Ala Phe Asp Val Thr Thr Lys Gly Ile Leu His
20 25 30
Val Ala Leu His Asn Gln Tyr Trp Arg Leu Ile Asp Pro Gln Gly Lys
35 40 45
Pro Thr Gly Val Met Gly Trp Trp Pro Ser Arg Ala Val Thr Tyr Leu
50 55 60
Glu Asn His Asp Thr Gly Ser Thr Gln Gly His Trp Pro Phe Pro Arg
65 70 75 80
Asp Lys Leu Thr Gln Gly Tyr Ala Tyr Ile Leu Thr His Pro Gly Thr
85 90 95
Pro Thr Ile Phe Tyr Asp His Phe Tyr Asp Phe Gly Leu His Asp Thr
100 105 110
Ile Thr Glu Leu Ile Asp Ala Arg Thr Arg Ala Gly Ile His Cys Arg
115 120 125
Ser Thr Leu Lys Ile Phe His Ala Asn Asn Glu Gly Tyr Ala Ala Gln
130 135 140
Ile Asp Glu Asn Leu Val Met Lys Leu Gly Gln Phe Asp
145 150 155

<210> 35
<211> 332
<212> PRT
<213> Eucalyptus grandis

<400> 35
Pro Thr Asp Ser Val Ser Pro Glu Gly Tyr Met Pro Arg Asp Leu Tyr
1 5 10 15
Asn Leu Asn Ser Arg Tyr Gly Thr Ile Asp Glu Leu Lys Asp Leu Val
20 25 30
Lys Lys Phe His Glu Val Asn Ile Arg Val Leu Gly Asp Val Val Leu
35 40 45
Asn His Arg Cys Ala Gln Tyr Gln Asn Gln Asn Gly Ile Trp Asn Ile
50 55 60
Phe Gly Gly Arg Leu Asn Trp Asp Asp Arg Ala Val Val Ala Asp Asp
65 70 75 80
Pro His Phe Gln Gly Arg Gly Asn Lys Ser Ser Gly Asp Asn Phe His
85 90 95
Ala Ala Pro Asn Ile Asp His Ser Gln Asp Phe Val Arg Lys Asp Leu
100 105 110
Lys Glu Trp Leu His Trp Leu Arg Ser Glu Ile Gly Tyr Asp Gly Trp
115 120 125
Arg Leu Asp Phe Val Arg Gly Phe Trp Gly Gly Tyr Val Lys Asp Tyr
130 135 140
Leu Asp Ala Ser Glu Pro Tyr Phe Ala Val Gly Glu Tyr Trp Asp Ser

145 150 155 160
Leu Ser Tyr Thr Tyr Gly Glu Met Asp His Asn Gln Asp Ala His Arg
165 170 175
Gln Arg Ile Ile Asp Trp Ile Asn Ala Thr Asn Gly Thr Ala Gly Ala
180 185 190
Phe Asp Val Thr Thr Lys Gly Ile Leu His Ala Ala Leu Glu Arg Cys
195 200 205
Glu Tyr Trp Arg Leu Ser Asp Gln Lys Gly Lys Pro Pro Gly Val Val
210 215 220
Gly Trp Trp Pro Ser Arg Ala Val Thr Phe Val Glu Asn His Asp Thr
225 230 235 240
Gly Ser Thr Gln Gly His Trp Arg Phe Pro Ser Gly Lys Glu Met Gln
245 250 255
Gly Tyr Ala Tyr Ile Leu Thr His Pro Gly Thr Pro Ala Val Phe Tyr
260 265 270
Asp His Ile Phe Ser His Tyr Gln Ser Glu Ile Gly Ser Leu Ile Ser
275 280 285
Ile Arg Asn Arg Asn Lys Ile His Cys Arg Ser Thr Ile Lys Ile Thr
290 295 300
Lys Ala Glu Arg Asp Val Tyr Ala Ala Ile Ile Asp Asp Lys Val Ala
305 310 315 320
Met Lys Ile Gly Pro Gly Tyr Tyr Glu Pro Gln Ser
325 330

<210> 36
<211> 251
<212> PRT
<213> Eucalyptus grandis

<400> 36
Met Met Glu Ser Gly Val Pro Leu Cys Asn Thr Cys Gly Glu Ala Val
1 5 10 15
Gly Val Asp Glu Lys Gly Glu Val Phe Val Ala Cys Gln Glu Cys Asn
20 25 30
Phe Ala Ile Cys Lys Ala Cys Val Glu Tyr Glu Ile Lys Glu Gly Arg
35 40 45
Lys Ala Cys Leu Arg Cys Gly Thr Pro Phe Glu Ala Asn Ser Met Ala
50 55 60
Asp Ala Glu Arg Asn Glu Leu Gly Ser Arg Ser Thr Met Ala Ala Gln
65 70 75 80
Leu Asn Asp Pro Gln Asp Thr Gly Ile His Ala Arg His Ile Ser Ser
85 90 95
Val Ser Thr Leu Asp Ser Glu Tyr Asn Asp Glu Thr Gly Asn Pro Ile
100 105 110
Trp Lys Asn Arg Val Glu Ser Trp Lys Asp Lys Lys Asn Lys Lys Lys
115 120 125
Lys Ala Pro Thr Lys Ala Glu Lys Glu Ala Gln Val Pro Pro Glu Gln
130 135 140
Gln Met Glu Glu Lys Gln Ile Ala Asp Ala Ser Glu Pro Leu Ser Thr
145 150 155 160
Val Ile Pro Ile Ala Lys Ser Lys Leu Ala Pro Tyr Arg Thr Val Ile
165 170 175
Ile Met Arg Leu Ile Ile Leu Ala Leu Phe Phe His Tyr Arg Val Thr
180 185 190
His Pro Val Asp Ser Ala Tyr Pro Leu Trp Leu Thr Ser Ile Ile Cys
195 200 205
Glu Ile Trp Phe Ala Tyr Ser Trp Val Leu Asp Gln Phe Pro Lys Trp

210 215 220
Ser Pro Val Asn Arg Ile Thr His Val Asp Arg Leu Ser Ala Arg Tyr
225 230 235 240
Glu Lys Glu Gly Glu Pro Ser Glu Leu Ala Val
245 250

<210> 37
<211> 127
<212> PRT
<213> Pinus radiata

<400> 37
Leu Pro Arg Leu Val Tyr Val Ser Arg Glu Lys Arg Pro Gly Tyr Gln
1 5 10 15
His His Lys Lys Ala Gly Ala Met Asn Ala Leu Val Arg Val Ser Ala
20 25 30
Val Leu Thr Asn Ala Pro Phe Ile Leu Asn Leu Asp Cys Asp His Tyr
35 40 45
Leu Asn Asn Ser Lys Ala Val Arg Glu Ala Met Cys Phe Leu Met Asp
50 55 60
Pro Gln Leu Gly Lys Lys Leu Cys Tyr Val Gln Phe Pro Gln Arg Phe
65 70 75 80
Asp Gly Ile Asp Arg His Asp Arg Tyr Ala Asn Arg Asn Thr Val Phe
85 90 95
Phe Asp Ile Asn Met Lys Gly Leu Asp Gly Ile Gln Gly Pro Val Tyr
100 105 110
Val Gly Thr Gly Cys Val Phe Asn Arg Gln Ala Leu Tyr Gly Tyr
115 120 125

<210> 38
<211> 534
<212> PRT
<213> Eucalyptus grandis

<400> 38
His Tyr Ile Asn Asn Ser Lys Ala Ile Arg Glu Ala Met Cys Phe Leu
1 5 10 15
Met Asp Pro Gln Leu Gly Lys Lys Leu Cys Tyr Val Gln Phe Pro Gln
20 25 30
Arg Phe Asp Gly Ile Asp Arg His Asp Arg Tyr Ala Asn Arg Asn Ile
35 40 45
Val Phe Phe Asp Ile Asn Met Arg Gly Leu Asp Gly Ile Gln Gly Pro
50 55 60
Val Tyr Val Gly Thr Gly Cys Val Phe Asn Arg Gln Ala Leu Tyr Gly
65 70 75 80
Tyr Asp Pro Pro Val Ser Gln Lys Arg Pro Lys Met Thr Cys Asp Cys
85 90 95
Trp Pro Ser Trp Cys Ser Cys Cys Cys Gly Gly Ser Arg Lys Ser Lys
100 105 110
Ser Lys Lys Lys Asp Asp Thr Ser Leu Leu Gly Pro Val His Ala Lys
115 120 125
Lys Lys Lys Met Thr Gly Lys Asn Tyr Leu Lys Lys Lys Gly Ser Gly
130 135 140
Pro Val Phe Asp Leu Glu Asp Ile Glu Glu Gly Leu Glu Gly Phe Asp
145 150 155 160
Glu Leu Glu Lys Ser Ser Leu Met Ser Gln Lys Asn Phe Glu Lys Arg
165 170 175

Phe Gly Gln Ser Pro Val Phe Ile Ala Ser Thr Leu Met Glu Asp Gly
180 185 190
Gly Leu Pro Glu Gly Thr Asn Ser Thr Ser Leu Ile Lys Glu Ala Ile
195 200 205
His Val Ile Ser Cys Gly Tyr Glu Glu Lys Thr Glu Trp Gly Lys Glu
210 215 220
Ile Gly Trp Ile Tyr Gly Ser Val Thr Glu Asp Ile Leu Thr Gly Phe
225 230 235 240
Lys Met His Cys Arg Gly Trp Lys Ser Val Tyr Cys Met Pro Lys Arg
245 250 255
Pro Ala Phe Lys Gly Ser Ala Pro Ile Asn Leu Ser Asp Arg Leu His
260 265 270
Gln Val Leu Arg Trp Ala Leu Gly Ser Val Glu Ile Phe Leu Ser Arg
275 280 285
His Cys Pro Leu Trp Tyr Ala Trp Gly Gly Lys Leu Lys Leu Leu Glu
290 295 300
Arg Leu Ala Tyr Ile Asn Thr Ile Val Tyr Pro Phe Thr Ser Ile Pro
305 310 315 320
Leu Leu Phe Tyr Cys Thr Ile Pro Ala Val Cys Leu Leu Thr Gly Lys
325 330 335
Phe Ile Ile Pro Thr Leu Thr Asn Phe Ala Ser Ile Trp Phe Leu Ala
340 345 350
Leu Phe Leu Ser Ile Ile Ala Thr Gly Val Leu Glu Leu Arg Trp Ser
355 360 365
Gly Val Ser Ile Glu Asp Trp Trp Arg Asn Glu Gln Phe Trp Val Ile
370 375 380
Gly Gly Val Ser Ala His Leu Phe Ala Val Phe Gln Gly Leu Leu Lys
385 390 395 400
Val Leu Ala Gly Val Asp Thr Asn Phe Thr Val Thr Ala Lys Ala Ala
405 410 415
Glu Asp Ser Glu Phe Gly Glu Leu Tyr Leu Phe Lys Trp Thr Thr Leu
420 425 430
Leu Ile Pro Pro Thr Thr Leu Ile Ile Leu Asn Met Val Gly Val Val
435 440 445
Ala Gly Val Ser Asp Ala Ile Asn Asn Gly Tyr Gly Ser Trp Gly Pro
450 455 460
Leu Phe Gly Lys Leu Phe Phe Ala Phe Trp Val Ile Val His Leu Tyr
465 470 475 480
Pro Phe Leu Lys Gly Leu Met Gly Lys Gln Asn Arg Thr Pro Thr Ile
485 490 495
Val Val Leu Trp Ser Val Leu Leu Ala Ser Ile Phe Ser Leu Val Trp
500 505 510
Val Arg Ile Asp Pro Phe Leu Pro Lys Gln Thr Gly Pro Val Leu Lys
515 520 525
Pro Cys Gly Val Glu Cys
530

<210> 39
<211> 133
<212> PRT
<213> Pinus radiata

<400> 39
Leu Ala Leu Phe Leu Thr Trp Arg Val Lys Asn Pro Asn Thr Asp Ala
1 5 10 15
Tyr Trp Leu Trp Gly Met Ser Ile Val Cys Glu Leu Trp Phe Ala Phe
20 25 30

Ser Trp Leu Leu Asp Gln Leu Pro Lys Leu Cys Pro Ile Asn Arg Ser
35 40 45
Thr Asp Leu Ala Val Leu Lys Asp Lys Phe Glu Ser Pro Thr Gly Asp
50 55 60
Asn Pro Ala Gly Arg Ser Asp Leu Pro Gly Ile Asp Cys Phe Val Ser
65 70 75 80
Thr Ala Asp Pro Glu Lys Glu Pro Pro Leu Val Thr Ala Asn Thr Ile
85 90 95
Leu Ser Ile Leu Ser Ala Asp Tyr Pro Val Glu Lys Leu Ala Cys Tyr
100 105 110
Val Ser Asp Asp Gly Gly Ala Leu Leu Thr Phe Glu Ala Met Ala Glu
115 120 125
Ala Ala Ser Phe Ala
130

<210> 40
<211> 206
<212> PRT
<213> Pinus radiata

<400> 40
Leu Leu Val Ser Gln Arg Ser Phe Glu Lys Ser Phe Gly Gln Ser Ser
1 5 10 15
Val Phe Ile Ala Ser Thr Leu Met Asp Asn Gly Gly Val Pro Glu Ser
20 25 30
Thr Asn Pro Ala Ser Leu Ile Lys Glu Ala Ile His Val Ile Ser Cys
35 40 45
Gly Tyr Glu Glu Lys Thr Glu Trp Gly Lys Glu Val Gly Trp Ile Tyr
50 55 60
Gly Ser Val Thr Glu Asp Ile Leu Thr Gly Phe Lys Met His Cys Arg
65 70 75 80
Gly Trp Arg Ser Ile Tyr Cys Met Pro Lys Arg Pro Ala Phe Lys Gly
85 90 95
Ser Ala Pro Ile Asn Leu Ser Asp Arg Leu His Gln Val Leu Arg Trp
100 105 110
Ala Leu Gly Ser Ile Glu Ile Leu Phe Ser Arg His Cys Pro Leu Trp
115 120 125
Tyr Gly Phe Gly Ala Gly Arg Leu Lys Trp Leu Glu Arg Leu Ala Tyr
130 135 140
Thr Asn Thr Ile Val Tyr Pro Leu Thr Ser Leu Pro Leu Ile Ala Tyr
145 150 155 160
Cys Thr Leu Pro Ala Ile Cys Leu Leu Thr Gly Glu Phe Ile Ile Pro
165 170 175
Thr Leu Ser Asn Leu Ala Ser Ile Tyr Phe Met Leu Leu Phe Ile Ser
180 185 190
Ile Ile Val Thr Gly Val Leu Glu Leu Arg Trp Ser Gly Val
195 200 205

<210> 41
<211> 239
<212> PRT
<213> Eucalyptus grandis

<400> 41
Leu Ala Leu Arg His Asp Arg Glu Gly Glu Pro Ser Gln Leu Ala Pro
1 5 10 15
Val Asp Val Phe Val Ser Thr Val Asp Pro Leu Lys Glu Pro Pro Leu

20 25 30
Ile Thr Ala Asn Thr Val Leu Ser Ile Leu Ala Val Asp Tyr Pro Val
35 40 45
Asp Lys Val Ser Cys Tyr Val Ser Asp Asp Gly Ser Ala Met Leu Thr
50 55 60
Phe Glu Ala Leu Ser Glu Thr Ala Glu Phe Ala Arg Lys Trp Val Pro
65 70 75 80
Phe Cys Lys Lys His Asn Ile Glu Pro Arg Ala Pro Glu Phe Tyr Phe
85 90 95
Ala Gln Lys Ile Asp Tyr Leu Lys Asp Lys Ile Gln Pro Ser Phe Val
100 105 110
Lys Glu Arg Arg Ala Met Lys Arg Glu Tyr Glu Glu Phe Lys Val Arg
115 120 125
Ile Asn Ala Leu Val Ala Lys Ala Gln Lys Met Pro Glu Glu Gly Trp
130 135 140
Thr Met Gln Asp Gly Thr Ala Trp Pro Gly Asn Asn Pro Arg Asp His
145 150 155 160
Pro Gly Met Ile Gln Val Phe Leu Gly His Ser Gly Gly Leu Asp Thr
165 170 175
Asp Gly Asn Glu Leu Pro Arg Leu Val Tyr Val Ser Arg Glu Lys Arg
180 185 190
Pro Gly Phe Gln His His Lys Lys Ala Gly Ala Met Asn Ala Leu Ile
195 200 205
Arg Val Ser Ala Val Leu Thr Asn Gly Ala Tyr Leu Leu Asn Val Asp
210 215 220
Cys Asp His Tyr Phe Asn Asn Ser Lys Ala Leu Lys Glu Ala Met
225 230 235

<210> 42
<211> 253
<212> PRT
<213> Eucalyptus grandis

<400> 42
Ile Ser Cys Gly Tyr Glu Asp Lys Thr Glu Trp Gly Lys Glu Ile Gly
1 5 10 15
Trp Ile Tyr Gly Ser Val Thr Glu Asp Ile Leu Thr Gly Phe Lys Met
20 25 30
His Ala Arg Gly Trp Ile Ser Ile Tyr Cys Met Pro Pro Arg Pro Ala
35 40 45
Phe Lys Gly Ser Ala Pro Ile Asn Leu Ser Asp Arg Leu Asn Gln Val
50 55 60
Leu Arg Trp Ala Leu Gly Ser Ile Glu Ile Leu Leu Ser Arg His Cys
65 70 75 80
Pro Ile Trp Tyr Gly Tyr Asn Gly Lys Leu Arg Leu Leu Glu Arg Leu
85 90 95
Ala Tyr Ile Asn Thr Ile Val Tyr Pro Leu Thr Ser Ile Pro Leu Ile
100 105 110
Ala Tyr Cys Ile Leu Pro Ala Phe Cys Leu Leu Thr Asn Lys Phe Ile
115 120 125
Ile Pro Glu Ile Ser Asn Phe Ala Ser Met Trp Phe Ile Leu Leu Phe
130 135 140
Val Ser Ile Phe Thr Thr Gly Ile Leu Glu Leu Arg Trp Ser Gly Val
145 150 155 160
Ser Ile Glu Asp Trp Trp Arg Asn Glu Gln Phe Trp Val Ile Gly Gly
165 170 175
Thr Ser Ala His Leu Phe Ala Val Phe Gln Gly Leu Leu Lys Val Leu

```
            180                 185                 190
Ala Gly Ile Asp Thr Asn Phe Thr Val Thr Ser Lys Ala Gly Asp Glu
        195                 200                 205
Asp Gly Asp Phe Ala Glu Leu Tyr Val Phe Lys Trp Thr Ser Leu Leu
    210                 215                 220
Ile Pro Pro Thr Thr Val Leu Ile Val Asn Ile Ile Gly Ile Val Ala
225                 230                 235                 240
Gly Val Ser Tyr Ala Ile Asn Ser Gly Tyr Gln Ser Trp
                245                 250

      <210> 43
      <211> 469
      <212> PRT
      <213> Eucalyptus grandis

      <400> 43
Gln Cys Phe Ser Ile Leu Ala Val Asp Tyr Pro Val Asp Lys Val Ser
 1               5                  10                  15
Cys Tyr Leu Ser Asp Asp Gly Ala Ala Met Leu Ser Phe Glu Ser Leu
            20                  25                  30
Val Glu Thr Ala Asp Phe Ala Arg Lys Trp Val Pro Phe Cys Lys Lys
        35                  40                  45
Tyr Ser Ile Glu Pro Arg Ala Pro Glu Phe Tyr Phe Ser Gln Lys Ile
    50                  55                  60
Asp Tyr Leu Lys Asp Lys Ile Gln Pro Ser Phe Val Lys Glu Arg Arg
65                  70                  75                  80
Ala Met Lys Arg Asp Tyr Glu Glu Phe Lys Val Arg Val Asn Ala Leu
                85                  90                  95
Val Ala Lys Ala Gln Lys Ala Pro Glu Glu Gly Trp Ser Met Gln Asp
            100                 105                 110
Gly Thr Pro Trp Pro Gly Asn Asn Ser Arg Asp His Pro Gly Met Ile
        115                 120                 125
Gln Val Phe Leu Gly Ser Ser Gly Ala His Asp Ile Glu Gly Asn Glu
    130                 135                 140
Leu Pro Arg Leu Val Tyr Val Ser Arg Glu Lys Arg Pro Gly Phe Gln
145                 150                 155                 160
His His Lys Lys Ala Gly Ala Glu Asn Ala Leu Val Arg Val Ser Ala
                165                 170                 175
Ile Leu Thr Asn Ala Pro Tyr Ile Leu Asn Leu Asp Cys Asp His Tyr
            180                 185                 190
Val Asn Tyr Ser Asn Ala Val Arg Glu Ala Met Cys Phe Leu Met Asp
        195                 200                 205
Pro Gln Val Gly Arg Asn Leu Cys Tyr Val Gln Phe Pro Gln Arg Phe
    210                 215                 220
Asp Gly Ile Asp Arg Ser Asp Arg Tyr Ala Asn Arg Asn Thr Val Phe
225                 230                 235                 240
Phe Asp Val Asn Met Lys Gly Leu Asp Gly Ile Gln Gly Pro Val Tyr
                245                 250                 255
Val Gly Thr Gly Cys Val Phe Asn Arg Gln Ala Leu Tyr Gly Tyr Gly
            260                 265                 270
Pro Pro Ser Met Pro Asn Leu Pro Lys Pro Ser Ser Ser Cys Ser Trp
        275                 280                 285
Cys Gly Cys Cys Ser Cys Cys Cys Pro Ser Lys Lys Pro Thr Lys Asp
    290                 295                 300
Leu Ser Glu Val Tyr Arg Asp Ser Lys Arg Glu Asp Leu Asn Ala Ala
305                 310                 315                 320
Ile Phe Asn Leu Gly Glu Ile Asp Asn Tyr Asp Glu His Glu Arg Ser
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                325                 330                 335
Met Leu Ile Ser Gln Met Ser Phe Glu Lys Thr Phe Gly Leu Ser Thr
            340                 345                 350
Val Phe Ile Glu Ser Thr Leu Leu Ala Asn Gly Gly Val Pro Glu Ser
        355                 360                 365
Ala His Pro Ser Met Leu Ile Lys Glu Ala Ile His Val Ile Ser Cys
    370                 375                 380
Gly Tyr Glu Glu Lys Thr Ala Trp Gly Lys Glu Ile Gly Trp Ile Tyr
385                 390                 395                 400
Gly Ser Val Thr Glu Asp Ile Leu Thr Gly Phe Lys Met His Cys Arg
                405                 410                 415
Gly Trp Arg Ser Val Tyr Cys Met Pro Leu Arg Pro Ala Phe Lys Gly
            420                 425                 430
Ser Ala Pro Ile Asn Leu Ser Asp Arg Leu His Gln Val Leu Arg Trp
        435                 440                 445
Ala Leu Gly Ser Val Glu Ile Phe Leu Ser Arg His Cys Pro Leu Trp
    450                 455                 460
Tyr Gly Phe Gly Gly
465

      <210> 44
      <211> 805
      <212> PRT
      <213> Eucalyptus grandis

      <400> 44
Met Ala Asp Arg Met Leu Thr Arg Ser His Ser Leu Arg Glu Arg Leu
 1               5                  10                  15
Asp Glu Thr Leu Ser Ala His Arg Asn Asp Ile Val Ala Phe Leu Ser
            20                  25                  30
Arg Val Glu Ala Lys Gly Lys Gly Ile Leu Gln Arg His Gln Ile Phe
        35                  40                  45
Ala Glu Phe Glu Ala Ile Ser Glu Glu Ser Arg Ala Lys Leu Leu Asp
    50                  55                  60
Gly Ala Phe Gly Glu Val Leu Lys Ser Thr Gln Glu Ala Ile Val Ser
65                  70                  75                  80
Pro Pro Trp Val Ala Leu Ala Val Arg Pro Arg Pro Gly Val Trp Glu
                85                  90                  95
His Ile Arg Val Asn Val His Ala Leu Val Leu Glu Gln Leu Glu Val
            100                 105                 110
Ala Glu Tyr Leu His Phe Lys Glu Glu Leu Ala Asp Gly Ser Leu Asn
        115                 120                 125
Gly Asn Phe Val Leu Glu Leu Asp Phe Glu Pro Phe Thr Ala Ser Phe
    130                 135                 140
Pro Arg Pro Thr Leu Ser Lys Ser Ile Gly Asn Gly Val Glu Phe Leu
145                 150                 155                 160
Asn Arg His Leu Ser Ala Lys Leu Phe His Asp Lys Glu Ser Leu His
                165                 170                 175
Pro Leu Leu Glu Phe Leu Gln Val His Cys Tyr Lys Gly Lys Asn Met
            180                 185                 190
Met Val Asn Ala Arg Ile Gln Asn Val Phe Ser Leu Gln His Val Leu
        195                 200                 205
Arg Lys Ala Glu Glu Tyr Leu Thr Ser Leu Lys Pro Glu Thr Pro Tyr
    210                 215                 220
Ser Gln Phe Glu His Lys Phe Gln Glu Ile Gly Leu Glu Arg Gly Trp
225                 230                 235                 240
Gly Asp Thr Ala Glu Arg Val Leu Glu Met Ile Gln Leu Leu Leu Asp
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                245                 250                 255
Leu Leu Glu Ala Pro Asp Pro Cys Thr Leu Glu Lys Phe Leu Asp Arg
            260                 265                 270
Val Pro Met Val Phe Asn Val Val Ile Met Ser Pro His Gly Tyr Phe
        275                 280                 285
Ala Gln Asp Asp Val Leu Gly Tyr Pro Asp Thr Gly Gly Gln Val Val
    290                 295                 300
Tyr Ile Leu Asp Gln Val Arg Ala Leu Glu Glu Glu Met Leu His Arg
305                 310                 315                 320
Ile Lys Gln Gln Gly Leu Asp Ile Thr Pro Arg Ile Leu Ile Ile Thr
                325                 330                 335
Arg Leu Leu Pro Asp Ala Val Gly Thr Thr Cys Gly Gln Arg Leu Glu
            340                 345                 350
Lys Val Phe Gly Thr Glu Tyr Ser His Ile Leu Arg Val Pro Phe Arg
        355                 360                 365
Asn Glu Lys Gly Val Val Arg Lys Trp Ile Ser Arg Phe Glu Val Trp
    370                 375                 380
Pro Tyr Leu Glu Arg Tyr Thr Glu Asp Val Ala Ser Glu Leu Ala Gly
385                 390                 395                 400
Glu Leu Gln Gly Lys Pro Asp Leu Ile Ile Gly Asn Tyr Ser Asp Gly
                405                 410                 415
Asn Ile Val Ala Ser Leu Leu Ala His Lys Leu Gly Val Thr Gln Cys
            420                 425                 430
Thr Ile Ala His Ala Leu Glu Lys Thr Lys Tyr Pro Glu Ser Asp Ile
        435                 440                 445
Tyr Trp Lys Lys Phe Glu Glu Lys Tyr His Phe Ser Cys Gln Phe Thr
    450                 455                 460
Ala Asp Leu Ile Ala Met Asn His Thr Asp Phe Ile Ile Thr Ser Thr
465                 470                 475                 480
Phe Gln Glu Ile Ala Gly Ser Lys Asp Thr Val Gly Gln Tyr Glu Ser
                485                 490                 495
His Met Asn Phe Thr Leu Pro Gly Leu Tyr Arg Val Val His Gly Ile
            500                 505                 510
Asp Val Phe Asp Pro Lys Phe Asn Ile Val Ser Pro Gly Ala Asp Met
        515                 520                 525
Ser Ile Tyr Phe Ala Tyr Thr Glu Gln Glu Arg Arg Leu Lys Ser Phe
    530                 535                 540
His Pro Glu Ile Glu Glu Leu Leu Phe Ser Asp Val Glu Asn Lys Glu
545                 550                 555                 560
His Leu Cys Val Leu Lys Asp Lys Lys Lys Pro Ile Ile Phe Thr Met
                565                 570                 575
Ala Arg Leu Asp Arg Val Lys Asn Leu Thr Gly Leu Val Glu Trp Tyr
            580                 585                 590
Gly Lys Asn Ser Lys Leu Arg Glu Leu Ala Asn Leu Val Val Val Gly
        595                 600                 605
Gly Asp Arg Arg Lys Asp Ser Lys Asp Leu Glu Glu Gln Ser Glu Met
    610                 615                 620
Lys Lys Met Tyr Asp Leu Ile Glu Lys Tyr Lys Leu Asn Gly Gln Phe
625                 630                 635                 640
Arg Trp Ile Ser Ser Gln Met Asn Arg Val Arg Asn Gly Glu Leu Tyr
                645                 650                 655
Arg Tyr Ile Cys Asp Thr Lys Gly Val Phe Val Gln Pro Ala Ile Tyr
            660                 665                 670
Glu Ala Phe Gly Leu Thr Val Val Glu Ala Met Thr Cys Gly Leu Pro
        675                 680                 685
Thr Phe Ala Thr Cys Asn Gly Gly Pro Ala Glu Ile Ile Val His Gly
    690                 695                 700
```

Lys Ser Gly Tyr His Ile Asp Pro Tyr His Gly Asp Gln Ala Ala Glu
705 710 715 720
Leu Leu Val Asp Phe Phe Asn Lys Cys Lys Ile Asp Gln Ser His Trp
725 730 735
Asp Glu Ile Ser Lys Gly Ala Met Gln Arg Ile Glu Glu Lys Tyr Thr
740 745 750
Trp Lys Ile Tyr Ser Glu Arg Leu Leu Asn Leu Thr Ala Val Tyr Gly
755 760 765
Phe Trp Lys His Val Thr Asn Leu Asp Arg Arg Glu Ser Arg Arg Tyr
770 775 780
Leu Glu Met Phe Tyr Ala Leu Lys Tyr Arg Pro Leu Ala Gln Ser Val
785 790 795 800
Pro Pro Ala Val Glu
805

<210> 45
<211> 133
<212> PRT
<213> Pinus radiata

<400> 45
Ile Lys Gln Gln Gly Leu Asp Ile Thr Pro Gln Ile Ile Val Val Thr
1 5 10 15
Arg Leu Ile Pro Glu Ala His Gly Thr Thr Cys Asn Gln Arg Ile Glu
20 25 30
Lys Val Ser Gly Thr Gln His Ser Leu Ile Leu Arg Val Pro Phe Arg
35 40 45
Thr Glu Lys Gly Val Leu Arg Asn Trp Val Ser Arg Phe Asp Val Trp
50 55 60
Pro Tyr Leu Glu Arg Phe Ser Glu Asp Val Thr Asn Glu Val Thr Ala
65 70 75 80
Glu Leu Lys Gly Gln Pro Asp Leu Ile Ile Gly Asn Tyr Ser Asp Gly
85 90 95
Asn Leu Val Ala Ser Leu Ile Ala His Lys Gln Gly Ile Thr Gln Cys
100 105 110
Asn Ile Ala His Ala Leu Glu Lys Thr Lys Tyr Pro Asp Ser Asp Ile
115 120 125
Tyr Trp Lys Asn Phe
130

<210> 46
<211> 158
<212> PRT
<213> Pinus radiata

<400> 46
His Gly Ile Asp Val Phe Asp Pro Lys Phe Asn Ile Val Ser Pro Gly
1 5 10 15
Ala Asp Met Gln Ile Tyr Phe Pro Tyr Thr Glu Lys Gln His Arg Leu
20 25 30
Thr Thr Leu His Gly Thr Ile Glu Glu Leu Leu Phe Ser Pro Glu Gln
35 40 45
Thr Ala Glu His Met Cys Ala Leu Asn Asp Arg Lys Lys Pro Ile Ile
50 55 60
Phe Ser Met Ala Arg Leu Asp Arg Val Lys Asn Met Thr Gly Leu Val
65 70 75 80
Glu Trp Phe Ala Lys Ser Lys Arg Leu Arg Glu Leu Val Asn Leu Val

```
                85                  90                  95
Val Val Ala Gly Asp Ile Asp Pro Ser Lys Ser Lys Asp Arg Glu Glu
            100                 105                 110
Val Ala Glu Ile Glu Lys Met His Arg Leu Val Lys Glu Tyr Asn Leu
        115                 120                 125
Asn Gly Gln Phe Arg Trp Ile Cys Ala Gln Lys Asn Arg Val Arg Asn
    130                 135                 140
Gly Glu Leu Tyr Arg Tyr Ile Cys Asp Thr Arg Gly Ala Phe
145                 150                 155
```

<210> 47
<211> 144
<212> PRT
<213> Eucalyptus grandis

<400> 47

```
Met Ala Asp Arg Val Leu Asn Arg Ser His Ser Pro Arg Glu Arg Leu
 1               5                  10                  15
Asp Glu Ala Leu Phe Ala Asp Arg Asn Asp Cys Leu Val Phe Leu Ser
            20                  25                  30
Arg Leu Lys Ala Lys Gly Lys Gly Ile Leu Gln Arg His Gln Ile Leu
        35                  40                  45
Ala Val Phe Glu Ala Ile Pro Glu Glu Ser Arg Ala Arg Leu Leu Asp
    50                  55                  60
Gly Ala Phe Gly Lys Val Leu Lys Ser Thr Gln Glu Ala Ile Val Ser
65                  70                  75                  80
Ser Pro Trp Val Ala Leu Ala Val Arg Ala Arg Pro Gly Val Trp Glu
                85                  90                  95
His Ile Arg Val Asn Val His Ala Leu Leu Leu Glu His Phe Gln Val
            100                 105                 110
Asp Glu Tyr Leu His Phe Lys Glu Ala Leu Val Asp Gly Ser Leu Asn
        115                 120                 125
Pro Asp Ser Glu Pro Leu Thr Ala Thr Phe Gly Arg Arg Pro Phe His
    130                 135                 140
```

<210> 48
<211> 90
<212> PRT
<213> Eucalyptus grandis

<400> 48

```
Gln Glu Ala Ile Val Ser Pro Pro Trp Val Ala Leu Ala Val Arg Pro
 1               5                  10                  15
Arg Pro Gly Val Trp Glu His Ile Arg Val Asn Val His Ala Leu Val
            20                  25                  30
Leu Glu Gln Leu Glu Val Ala Glu Tyr Leu His Phe Lys Glu Glu Leu
        35                  40                  45
Ala Asp Gly Ser Leu Asn Gly Asn Phe Val Leu Glu Leu Asp Phe Glu
    50                  55                  60
Pro Phe Thr Ala Ser Phe Pro Arg Pro Thr Leu Ser Lys Ser Ile Gly
65                  70                  75                  80
Asn Gly Val Glu Phe Arg Asn Arg His Leu
                85                  90
```

<210> 49
<211> 247
<212> PRT

<213> Pinus radiata

<400> 49

```
Met Ala Ala Ala Pro Ala Val Ala Ser Pro Ala Ala Glu Thr Asp Arg
 1               5                  10                  15
Ile Pro Lys Leu Gln Ala Glu Val Thr Lys Leu Asn Gln Ile Ser Asp
            20                  25                  30
Asn Glu Lys Glu Gly Phe Val Arg Leu Val Ser Arg Tyr Leu Ser Gly
        35                  40                  45
Glu Glu Glu Lys Ile Glu Trp Glu Lys Ile Lys Thr Pro Thr Asp Glu
    50                  55                  60
Ile Val Val Pro Tyr Asp Thr Leu Ala Ala Leu Gly Glu Asp Pro Ser
65                  70                  75                  80
Glu Thr Lys Glu Leu Leu Asp Lys Leu Val Val Leu Lys Leu Asn Gly
                85                  90                  95
Gly Leu Gly Thr Thr Met Gly Cys Thr Gly Pro Lys Ser Val Ile Glu
            100                 105                 110
Val Arg Asn Gly Leu Thr Phe Leu Asp Leu Ile Val Lys Gln Ile Glu
        115                 120                 125
Ser Leu Asn Asn Lys Tyr Asp Ser Lys Val Pro Leu Val Leu Met Asn
    130                 135                 140
Ser Phe Asn Thr His Asp Asp Thr Ile Lys Ile Val Glu Lys Tyr Ser
145                 150                 155                 160
Gly Ser Asn Ile Asp Ile His Ile Phe Asn Gln Ser Gln Tyr Pro Arg
                165                 170                 175
Met Val Ala Glu Asp Leu Thr Pro Trp Pro Thr Lys Gly Arg Thr Asp
            180                 185                 190
Lys Glu Ala Trp Tyr Pro Pro Gly His Gly Asp Val Phe Pro Ala Leu
        195                 200                 205
Leu Asn Ser Gly Lys Leu Asp Glu Leu Leu Ser Gln Gly Lys Glu Tyr
    210                 215                 220
Val Phe Ile Ala Asn Ser Asp Asn Leu Gly Ala Ile Val Asp Leu Ser
225                 230                 235                 240
Ile Leu Phe Ala Leu Val Phe
                245
```

<210> 50
<211> 103
<212> PRT
<213> Eucalyptus grandis

<400> 50

```
Met Ala Ala Ala Ala Thr Leu Ser Ala Pro Asp Ala Ala Lys Leu Ser
 1               5                  10                  15
Gln Leu Lys Ser Ala Val Ser Gly Leu Gly Gln Ile Ser Glu Ser Glu
            20                  25                  30
Lys Asn Gly Phe Ile Asn Leu Val Ser Arg Tyr Leu Ser Gly Glu Ala
        35                  40                  45
Gln His Val Asp Trp Ser Lys Ile Gln Thr Pro Thr Asp Glu Ile Val
    50                  55                  60
Val Pro Tyr Asp Ser Leu Ala Pro Thr Pro Gln Asp Pro Ala Ala Thr
65                  70                  75                  80
Lys Ser Leu Leu Asp Lys Leu Val Val Leu Lys Leu Asn Gly Gly Leu
                85                  90                  95
Gly Thr Thr Met Gly Cys Thr
            100
```

<210> 51
<211> 253
<212> PRT
<213> Pinus radiata

<400> 51
Ala Asn Ser Asp Asn Leu Gly Ala Ile Val Asp Leu Lys Ile Leu Asn
1   5   10   15
His Leu Val Lys Asn Lys Asn Glu Tyr Cys Met Glu Val Thr Pro Lys
            20   25   30
Thr Leu Ala Asp Val Lys Gly Gly Thr Leu Ile Ser Tyr Glu Gly Arg
        35   40   45
Val Gln Leu Leu Glu Ile Ala Gln Val Pro Glu Glu His Val Gly Glu
    50   55   60
Phe Lys Ser Ile Glu Lys Phe Lys Ile Phe Asn Thr Asn Asn Leu Trp
65   70   75   80
Val Asn Leu Lys Ala Ile Lys Arg Leu Val Glu Ala Asp Ala Leu Lys
                85   90   95
Met Glu Ile Ile Pro Asn Pro Lys Glu Val Asp Gly Val Lys Val Leu
            100   105   110
Gln Leu Glu Thr Ala Ala Gly Ala Ala Ile Arg Phe Phe Asp Arg Ala
        115   120   125
Ile Gly Val Asn Val Pro Arg Ser Arg Phe Leu Pro Val Lys Ala Thr
    130   135   140
Ser Asp Leu Leu Leu Val Gln Ser Asp Leu Tyr Thr Val Glu Glu Gly
145   150   155   160
Phe Val Ile Arg Asn Pro Ala Arg Val Asn Pro Thr Asn Pro Thr Ile
                165   170   175
Glu Leu Gly Pro Glu Phe Lys Lys Val Gly Asn Phe Leu Lys Arg Phe
            180   185   190
Lys Ser Ile Pro Ser Ile Ile Asp Leu Asp Ser Leu Lys Val Ser Gly
        195   200   205
Asp Val Trp Phe Gly Ser Gly Val Ile Leu Lys Gly Lys Val Ile Ile
    210   215   220
Glu Ala Lys Gln Gly Ala Thr Leu Glu Ile Pro Asp Glu Ser Val Ile
225   230   235   240
Glu Asn Lys Val Val Ser Ser Pro Asp Asp Ile Val Asn
                245   250

<210> 52
<211> 184
<212> PRT
<213> Pinus radiata

<400> 52
Met Ser Thr Ile Ile Val Pro Val Pro Ile Pro Thr Pro Ser Glu Asp
1   5   10   15
Ser Glu Arg Leu Arg Lys Ala Phe Glu Gly Trp Gly Thr Asn Glu Lys
            20   25   30
Ser Ile Ile Gln Ile Leu Gly His Arg Thr Ala Ala Gln Arg Lys Val
        35   40   45
Ile Arg Gln Ser Tyr Phe Gln Leu Tyr Glu Glu Asp Leu Leu Lys Arg
    50   55   60
Leu Glu Ser Glu Leu Ser Ser Asp Phe Glu Lys Ala Val Phe Leu Trp
65   70   75   80
Val Leu Asp Pro Ala Glu Arg Asp Ala Val Ile Ser His Gly Ala Ile
                85   90   95

Lys Lys Trp Asn Ala Lys Asn Ile Ser Leu Leu Glu Ile Ser Ser Ala
100 105 110
Arg Ser Ser Ala Glu Leu Leu Met Val Arg Gln Ala Tyr His Ile Arg
115 120 125
Asp Lys Lys Ser Leu Glu Glu Asp Val Ala Ala His Thr Ser Gly Asn
130 135 140
Phe Arg Lys Leu Leu Val Ala Leu Val Ser Ser Tyr Arg Tyr Glu Gly
145 150 155 160
Pro Glu Val Asp Met His Leu Ala Ser Tyr Glu Ala Lys Lys Leu Ser
165 170 175
Glu Ser Ile Thr Glu Gln Lys Arg
180

<210> 53
<211> 213
<212> PRT
<213> Pinus radiata

<400> 53
Met Ala Thr Cys Ser Cys Ala Val Ser Cys Gly Val Asn Pro Val Glu
1 5 10 15
Arg Asp Cys Glu Glu Ile His Leu Ala Cys Lys Gly Leu Gly Ser Asp
20 25 30
Glu Glu Lys Ile Ile Glu Ile Leu Gly Ser Lys Asn Glu Gln Gln Arg
35 40 45
Lys Glu Ile Arg Glu Thr Tyr Tyr Ala Met Tyr Lys Glu Asp Leu Cys
50 55 60
Lys Arg Leu Glu Lys Glu Leu His Gly Lys Leu Glu Lys Ala Ile Val
65 70 75 80
Leu Trp Met His Glu Pro Ala Asp Arg Asp Ala Ile Ile Ala Gly Thr
85 90 95
Ala Leu Glu Gly Trp Cys Thr Asp Asp Arg Ala Leu Ile Glu Val Ile
100 105 110
Cys Thr Arg Ser Ser Thr Gln Ile Val Lys Ile Arg Glu Ala Tyr Gln
115 120 125
Lys Arg Tyr Gln Arg Cys Leu Asp Asp Asp Val Ile Cys Lys Thr Asn
130 135 140
Gly Pro Phe Gln Lys Leu Leu Leu Ala Leu Leu Lys Ala His Arg Cys
145 150 155 160
Glu Cys Lys Gly Val Asp Ile Asn Lys Ala Arg Cys Asp Ala Lys Met
165 170 175
Leu Tyr Glu Ala Gly Glu Gly Arg Cys Gly Thr Asp Glu Asp Thr Phe
180 185 190
Ile Arg Ile Phe Gln Arg Gly Glu Cys Ser Gln Val His Ala Ile Phe
195 200 205
Ala Cys Asn Lys Gln
210

<210> 54
<211> 239
<212> PRT
<213> Eucalyptus grandis

<400> 54
Met Ala Thr Ile Ala Val Pro Pro Ser Val Pro Ser Pro Ala Glu Asp
1 5 10 15
Ala Glu Gln Leu Gln Lys Ala Phe Ala Gly Trp Gly Thr Asn Glu Asp

```
            20                      25                       30
Leu Ile Ile Ser Ile Leu Pro His Arg Asn Ala Ala Gln Arg Lys Val
        35                      40                      45
Ile Arg Gln Thr Tyr Ala Glu Thr Tyr Gly Glu Asp Leu Leu Lys Ala
    50                      55                      60
Leu Asp Lys Glu Leu Ser Ser Asp Phe Glu Arg Ser Val Leu Leu Trp
65                      70                      75                      80
Thr Leu Asp Pro Ala Glu Arg Asp Ala Phe Leu Ser Asn Glu Ala Thr
                85                      90                      95
Lys Arg Leu Thr Ser Ser Asn Trp Val Leu Met Glu Ile Ala Cys Thr
            100                     105                     110
Arg Ser Ser Met Glu Leu Phe Met Val Arg Gln Ala Tyr His Ala Arg
        115                     120                     125
Tyr Lys Lys Ser Leu Glu Glu Asp Ile Ala Tyr His Thr Thr Gly Asp
    130                     135                     140
Phe Arg Lys Leu Leu Val Pro Leu Ala Ser Thr Phe Arg Tyr Glu Gly
145                     150                     155                     160
Pro Glu Val Asn Met Thr Leu Ala Arg Ser Glu Ala Lys Ile Leu His
                165                     170                     175
Glu Lys Ile His Glu Lys Ala Tyr Asn His Asp Glu Leu Ile Arg Ile
            180                     185                     190
Val Thr Thr Arg Ser Lys Ala Gln Leu Asn Ala Thr Leu Asn Tyr Tyr
        195                     200                     205
Asn Asn Glu Phe Gly Asn Ala Ile Asn Lys Asp Leu Lys Ala Asp Pro
    210                     215                     220
Asn Asp Glu Phe Leu Lys Leu Leu Arg Ser Ala Ile Lys Cys Leu
225                     230                     235
```

<210> 55
<211> 242
<212> PRT
<213> Pinus radiata

<400> 55

```
Met Ser Thr Ile Ile Val Pro Ala Pro Ala Pro Ser Pro Val Glu Asp
 1               5                  10                  15
Ser Glu Arg Leu Arg Lys Ala Phe Glu Gly Trp Gly Thr Asn Glu Lys
            20                  25                  30
Leu Ile Ile Glu Ile Leu Gly His Arg Thr Ala Ala Gln Arg Arg Ala
        35                  40                  45
Ile Arg Gln Thr Tyr Thr Gln Leu Tyr Glu Glu Asp Phe Leu Lys Arg
    50                  55                  60
Leu Gln Ser Glu Leu Thr Arg Asp Phe Glu Arg Ala Leu Leu Leu Trp
65                  70                  75                  80
Ser Leu Asp Pro Pro Glu Arg Asp Ala Leu Leu Ala Tyr Glu Ser Ile
                85                  90                  95
Lys Lys Trp Ser Pro Asn Asn Arg Ser Leu Leu Glu Ile Ser Ser Ala
            100                 105                 110
Arg Ser Ser Thr Glu Leu Trp Ser Val Arg Gln Ala Tyr His Ile Arg
        115                 120                 125
Tyr Lys Lys Ser Leu Glu Glu Asp Val Ala Ser His Thr His Gly Asp
    130                 135                 140
Phe Arg Lys Leu Leu Val Gln Leu Val Ser Ser Tyr Arg Tyr Glu Gly
145                 150                 155                 160
Pro Glu Val Asp Thr Arg Leu Ala Lys Ser Glu Ala Lys Gln Leu His
                165                 170                 175
Glu Ala Ile Lys Asp Lys Ala Phe Gly Asn Glu Glu Leu Ile Arg Ile
```

180 185 190
Ile Thr Thr Arg Ser Lys Ala Gln Leu Asn Ala Thr Phe Asn Tyr Tyr
195 200 205
Lys Asp Asp Tyr Gly His His Ile Asn Lys Asp Leu Lys Glu Trp Glu
210 215 220
Ala Arg Arg Leu Pro Gly Val Thr Thr Asn Cys Tyr Gln Met His Leu
225 230 235 240
Leu Ser

<210> 56
<211> 316
<212> PRT
<213> Eucalyptus grandis

<400> 56
Met Ser Thr Leu Thr Val Pro Gln Pro Leu Pro Pro Val Ala Asp Asp
1 5 10 15
Cys Glu Gln Leu Arg Thr Ala Phe Ala Gly Trp Gly Thr Asn Glu Lys
20 25 30
Leu Ile Ile Ser Ile Leu Gly His Arg Asn Ala Ala Gln Arg Lys Leu
35 40 45
Ile Arg Gln Thr Tyr Ala Glu Thr Tyr Gly Glu Asp Leu Leu Lys Ala
50 55 60
Leu Asp Arg Glu Leu Thr Asn Asp Phe Glu Arg Leu Val Val Leu Trp
65 70 75 80
Ser Leu Asp Pro Ala Glu Arg Asp Ala Tyr Leu Ala Asn Glu Ala Thr
85 90 95
Lys Arg Trp Thr Ser Ser Asn Gln Val Leu Met Glu Ile Ala Cys Thr
100 105 110
Arg Ser Pro Gln Gln Leu Leu Met Ala Arg Gln Ala Tyr His Ala Arg
115 120 125
Tyr Lys Lys Ser Leu Glu Glu Asp Val Gly His His Thr Thr Gly Asp
130 135 140
Phe Arg Lys Leu Leu Val Pro Leu Val Ser Ser Tyr Arg Tyr Asp Gly
145 150 155 160
Asp Glu Val Asn Met Thr Leu Ala Lys Ala Glu Ala Lys Ile Leu His
165 170 175
Glu Lys Ile Ser Glu Lys Ala Tyr Gly His Glu Asp Leu Ile Arg Ile
180 185 190
Leu Ala Thr Arg Ser Lys Ala Gln Val Asn Ala Thr Leu Asn His Tyr
195 200 205
Lys Asn Glu Phe Gly Asn Asp Ile Asn Lys Asp Leu Lys Thr Asp Pro
210 215 220
Lys Asp Ala Phe Leu Thr Ile Leu Arg Ala Thr Val Lys Cys Leu Thr
225 230 235 240
Arg Pro Glu Lys Tyr Phe Glu Lys Val Leu Arg Leu Ala Ile Asn Lys
245 250 255
Arg Gly Thr Asp Glu Gly Ala Leu Thr Arg Val Val Ala Thr Arg Ala
260 265 270
Glu Val Asp Met Lys Phe Ile Ser Glu Glu Tyr Gln Arg Arg Asn Ser
275 280 285
Ile Pro Leu Asp Arg Ala Ile Val Lys Asp Thr Thr Gly Asp Tyr Glu
290 295 300
Lys Met Leu Leu Ala Leu Ile Gly His Val Glu Ala
305 310 315

<210> 57

<211> 418

<212> DNA

<213> Eucalyptus grandis

<400> 57

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ttttgatttt gcaaggggat attcaccaaa atatgtcaaa gagtacattg aaagtgcaaa     60
gccattattt tctgttgggg aatattggga ctcttgcaac tacagtggta ccaccttgga    120
atacaatcaa gatagtcaca gacaacgaat tgtaaactgg attgatggca cgggacagct    180
ttctgctgca tttgacttca caacaaaagg aattcttcag gaagcagtaa aagggcagtt    240
ttggcgtctg cgtgatccga aagggaagcc acctggtgtg atgggatggt ggccatcaag    300
agctgttacc ttccttgata accacgatac aggctcaaca caggctcact ggcctttccc    360
ttcaaatcat ataaggaggg ttacacgtac atactcactc atccaggaat acctactg      418
```

<210> 58
<211> 1396
<212> DNA
<213> Eucalyptus grandis

<400> 58

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atggatagct tcagcctctt ctggctcttc gttcttttgg tcttttacct cgccgcctca     60
gcatcccctg ccttgttatt tcaggggttc aactgggaat cttggaagaa ggaagggggа    120
tggtacaatt cgctcaagaa cttggtaccg gatttggcca atgctggaat tactcatgtg    180
tggcttcctc caccgtctca atctgccgct caacaagggt acctgcctgg gcggctctat    240
gatctcaatg cttcgagcta cgggaatcag gatgagttga agcatcttat tgatgctttc    300
catcaaaagg gaatcaaatg cctggccgac atagtgatta accacaggac tgcggaaaaa    360
caagatagcc ggggaatatg gtgcatcttc gaaggcggaa caccccgacga acgtcttgac    420
tgggggccgt cctttatttg tcgcgatgac actgagttct ctgatggcat gggtaatctt    480
gatacaggtg gggacttcaa taatacgccc gacatagacc acctcaatcc gagggtgcaa    540
aaggagctgt ctgactggat gaattggttg aagagcgata taggatttga tgggtggcga    600
ttcgatttcg tactgggtta tgacccaagc atcaccaaaa tctacatgga tcggactttg    660
ccgaattttg cggtgggaga gaactgggac tcgctctctt atggacagga taagaagccc    720
aacccaaacc aggatgcaca ccgccataag ctggcggaat gggtcaatgc tgcaggcggg    780
gccgtcacgg catttgattt caccacgaag gggatcctcc aggcggccgt tgaaggggag    840
ctttggcggt tgaaggattc aaacgggatg ccgccgggat tgattggcct ccagccaagc    900
agtgccgtga ctttcatcga caatcacgac actggttcca cgcaaaaaat atggccgttt    960
ccgtccgata aggtcatgca gggatatgcc tacatcctca cccatcctgg agtcccatcc   1020
attttctatg atcacttctt tgactggggc ctgaaggagg agatcggcaa gttgacggcg   1080
ataagggcgc ggaaccagat taacgagaag agcagtgtgg agatcttggc ttccgattct   1140
gatttatacg tggccaagat cgacgatgga gtgattatga agattggacc taggtttgaa   1200
gtaggaaacc ttgttcctcc caattatcag attgctacat ccggccaaga ttattgtgtg   1260
tgggagaaga agtgatgttc aggcaaactt aagaataagc agcaactgaa agagcaatta   1320
taggctgcat tgtttgaaat aaaaatttac aagcggtctt atgcaccgta tggaagtaaa   1380
aaaaaaaaaa aaaaaa                                                    1396
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<210> 59
<211> 1861
<212> DNA
<213> Pinus radiata

<400> 59

attgaatttc ggggaattca atacagacga aatggctggc gttatggccg caggagttgc 60
aaatttgaac gttctgggcc gagaaactgc cgagttcact tcgttcaggc cggtatttct 120
tcgaggaaat tctcagggac tctcttcggc ctcttctttg tgtgattaca gaattttcgc 180
ggattccaag cggaagaagc atgcgatttt caggaagcag aatattaata gaagcacagt 240
cgtttctcca cgggcggttt ctgatacttt cagtgaactg acctgtttag atccggtcgc 300
gagtcggagt gtgctgggca ttatcctagg aggtggagct gggactcgtc tttatccact 360
gactaagaag agagcgaaac cagctgttcc tttgggtgcc aattataggc tgatcgatat 420
ccctgttagt aattgcataa atagtaatat ctctaagatc tatgttctta cccagttcaa 480
ctcggcttct ctcaaccgtc atctttcacg ggcctattca agcaacatgg gcagctacaa 540
ggatgaagga tttgtggaag tacttgccgc tcagcaaagc cctgaaaatc caaattggtt 600
tcagggaaca gcagatgctg tgagacagta cttgtggctt tttgaggagc aacaagtaat 660
ggaatttctg attctagctg gagatcatct ctatcgtatg gattatcaga aattcattca 720
agctcacagg gaaaccaatg cagatatcac cgtggcagct ttacccatgg atgagaaacg 780
agcaacagct tttggtctaa tgaagattaa tgatgaaggc cgcatcattg aatttgcaga 840
gaaacccaaa ggagaagagt tgagggcaat gagggtggac actacaattt taggcctgga 900
tgaagagaga gccaaggaga tgccttacat agctagcatg ggatttatg ttgttagtaa 960
agatgcaatg ttgaagcttt tgcgtgaaca atttccccaa gcaaatgatt ttggaagtga 1020
agtcataccg ggtgccactt cagttggaat ggcggtacag gcatatttgt atgatggata 1080
ttgggaagat attggtacca tcgaggcttt ttataatgca aatttgggta ttaccaagaa 1140
gccaatacca gacttcagct tttatgatag atctgctcca atctatactc aatctcgatt 1200
tttgccacca tcgaagatgc ttgatgcaga tgtgactgac agtgttattg gcgagggatg 1260
tgtcataaag aactgtcaaa ttcgccactc cgttgttgga ctacgttctt ggatttcaga 1320
gggtgcaata atagaggatg ccttgctcat gggtgctgat tactatgaaa ctgatgaaga 1380
gcgaagcttg ctttcgaata aaggtggtgt cccaattggc attggaaaag actgccatgt 1440
aaaaagggca ataattgaca aaaatgctcg tattggaacc aatgtcaaga tcatcaacaa 1500
ggacaacgtg caagaagctg cgagggaaac agatgggtac ttcataaaga gtggtattgt 1560
aactgtaatc aaagatgctt taattcctag tggtacagtc atttaaaact atttggctgt 1620
acacaaattg cctcaaataa cactactttt ttccccacct ttagtcgata taccgggaaa 1680
atgcagcaat tcaaatattt ccttagaagg agagtcctgt attttagtgg aaaaataatg 1740
tatgacggaa gacattgatg gtttttgtaa ttatgtacga aattttattg gtcattgcct 1800
tcaatgcaac cgtcgatact tttatgctga aacggtctat atttttatac tgttccgagg 1860
a 1861

<210> 60
<211> 145
<212> DNA
<213> Eucalyptus grandis

<400> 60
gggacccagc tctcgactcc gccgatgcct tcaagagcgt gaggagagat ccggacgtcg 60
tgtctcccag agacgtctcc gattcccgga actcgcagac gtgccttaac cccgacgcca 120
gccgcagtgt tctcggaatt atact 145

<210> 61
<211> 441
<212> DNA
<213> Eucalyptus grandis

<400> 61
gggccccagc tctcgcctcc ggcgcggctg ccttcaagag cgtgcggaga gctccggccg 60
tcgtgtctcc cagagccgtc tccgattccc ggaactcgca gacgtgcctt gaccccgacg 120
ccagccgcag tgttctcgga attatactag gaggtggggc cgggacccgt ctctaccccc 180
tgactaagaa gagagcaaaa cccgccgtcc cgttgggagc aaattacagg ctgattgaca 240
ttcctgtgag caattgcttg aatagcaacg tatcgaagat ctatgtcctc acgcagttca 300
attctgcatc tctcaaccgt cacctttctc gggcttatgc cagcaacatg ggtgggtaca 360
aaaatgaagg ttttgttgaa gttcttgctg cccagcagag cccggagaat cctaactggt 420
ttcagggcac tgccgatgct g

<210> 62
<211> 460
<212> DNA
<213> Eucalyptus grandis

<400> 62
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cccaaagaaa gtggccgcca ttatattggg gggaggtgca 460

<210> 63
<211> 341
<212> DNA
<213> Eucalyptus grandis

<400> 63
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<210> 64
<211> 394
<212> DNA
<213> Eucalyptus grandis

<400> 64
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<210> 65
<211> 453
<212> DNA
<213> Eucalyptus grandis

<400> 65
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<210> 66
<211> 2055
<212> DNA
<213> Eucalyptus grandis

<400> 66
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<210> 67
<211> 669
<212> DNA
<213> Pinus radiata

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<210> 68
<211> 403
<212> DNA
<213> Pinus radiata

<400> 68
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<210> 69
<211> 3851
<212> DNA
<213> Pinus radiata

<400> 69
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gtaaggatat accattggcc gtcaacttac ctctgctatt attttatatc cctggaatgt   3780
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aaaaaaaaaa a                                                         3851
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<210> 70
<211> 736
<212> DNA
<213> Pinus radiata

<400> 70

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<210> 71
<211> 448
<212> DNA

<213> Eucalyptus grandis

<400> 71
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gaaaaagttt gatgagaagt accacttttc atgtcaattt actgctgact tactagccat    360
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<210> 72
<211> 448
<212> DNA
<213> Eucalyptus grandis

<400> 72
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aaagcagaag agactcacag ctttgcatgg atcaatagaa aagctgctat atgatcctga    300
acaaaatgat gagcacatag gatcattgtc tgatcggtcc aagcccatga tcttttccat    360
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<210> 73
<211> 184
<212> DNA
<213> Eucalyptus grandis

<400> 73
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<210> 74
<211> 1145
<212> DNA
<213> Pinus radiata

<400> 74
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<210> 75
<211> 1169
<212> DNA
<213> Pinus radiata

<400> 75
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<210> 76
<211> 420
<212> DNA
<213> Pinus radiata

<400> 76
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tgtgtatata cttgatcaat gtcgcgcctt ggagaatgaa atgctattga gaataaaaca 180
acaaggattg gacattacgc ctgagattat tgtggtgact cggctgatcc ctgaggctca 240
cgggacaaca tgcaatcaac gacttgaaaa aattagtgga acacaacatt cacggattct 300
acgggtgccc ttcagaacag aaaaaggagt cgtgcgcgac tgggtttctc gatttgatgt 360
gtggccttac ttggaaagat tttcggagga tgtaacaaat gaaatagccg tggagctgaa 420

<210> 77
<211> 448
<212> DNA
<213> Pinus radiata

<400> 77
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ctatctcttt agaagttcct cgcctctgta tttcacaaaa gtttcaggag tgtctgtgtt 120

gtaattccag tgtggacgga attgaattct gttatcagag gatccaccag cattgtagga 180
gggctaatag gcaacagcaa ataacagtta aattctcctt ttaattgttg gtattggcat 240
ccatataaaa gcaaaggaaa atatggttgc tgcagcgctc acccatgcac tgagttcacg 300
agagcgtgtt gaggacatgc tctctgaaca ccgcaatgaa atagtttctc tgctttcaag 360
atatgtagca gaagggaaga agattttgca gcctcatcaa ctattagatg gactagaaga 420
ggcataggaa gaatgttgac ttgaaccc 448

<210> 78
<211> 372
<212> DNA
<213> Eucalyptus grandis

<400> 78
gcgctctccc acgcactctg cttccagacc ccggataccc acgtgtatat atacccgtct 60
cccgtcgtca gcaggggtgg aggattcttg ggtttctgct ctgttcgtcg atcggcttga 120
gggaaggttc gaaggtgact gaaactcggc gtgttctgtc atggcggctc cgaaactggg 180
tcgaatcccg agcatcaggg accgggtcga ggacactctc gccgctcaca ggaacgaact 240
cgtctctctt ctctccaggt atgtggctca ggggaagggg attctgcagc cgcatcattt 300
gctggacgag ctcgagaaca tcatcagcga ggacgaaggg aagagctctc tcagcgatgg 360
ccccttcagt ga 372

<210> 79
<211> 1960
<212> DNA
<213> Eucalyptus grandis

<400> 79
cggccgagat tggttacact tgttattctc ccccccgtcg ctagccggcc acttttatat 60
cctcctcccg tttcgtactc ttcactcatc tccctcccca aaagcccaat cgaatctcgc 120
tcctcctttt ttttatcttc cacatcacca ccttcctcct cctcctcctc ctcctcagcg 180
ttctctccac gttcatctcc atcgctgtct ccctctcaga tccggagctc ttcttcgcta 240
gcccgccaat ggctgccgct gccaccctga gcgcccccga cgctgcgaag ctctctcagc 300
tcaaatcggc cgtctccggc ctcggccaaa tcagcgagag tgagaagaat ggattcatca 360
acctcgtgtc tcgctatctc agtggcgaag ctcaacatgt tgactggagc aagatccaga 420
cgcccactga cgaaattgtc gtcccttacg atagcttggc gcccactccc caggatcctg 480
cagcgaccaa gagccttttg gacaaactcg ttgtgctgaa gctcaatggt ggtttgggaa 540
ctacgatggg ttgtactggt cccaaatctg tcatagaagt acgcaatgga ttgacatttc 600
ttgaccttat tgttatccaa attgagaatc tgaacactaa atatgggtgc aatgttcccc 660
tgcttctgat gaactctttt aacacccatg atgatacgtt gaagattgtt gaaaaatatg 720
ccaactcaaa tatagatatt catactttta atcagagcca gtatccccgt ttggttgttg 780
aggattttat gccactgcct tgcaaaggac agactggaaa agatggatgg tatcctcctg 840
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agggcaagga atatgttttt gctgccaact cagataactt gggtgctatt gttgacctga 960
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ccttagctga tgtgaagggt ggtacactca tatcttatga gggaaaggtt caactcttgg 1080
aaattgcaca ggtccctgat gaacacatca atgagttcaa atcaattgag aagttcaaga 1140
ttttcaatac aaacaacttg tgggttaact taaaggcaat taaaaggctt gtcgaagctc 1200
aagctcttaa gatggagatc attcctaatc caaaggaagt ggatggaatt aaagttctgc 1260
agctagaaac tgcagctggt gcagcaatca agttctttga caatgctatt ggcatcaatg 1320
tacctcggtc gaggttcctt ccagtgaaag caacttcaga tctgcttctt gttcagtccg 1380
atctttatac tctggtggat ggttttgttg aacgaaacaa ggctagaaca aatccctcaa 1440
atccttcaat cgaattgggc cctgagttta agaaggttgg caatttcttg agcagattca 1500
agtcaattcc cagcattatt gagcttgata gcctgaaggt gtctggtgat gtatggtttg 1560
gcactggcat tactctcaag ggaaaggtga ccattgctgc aaaacctggg gttaagctgg 1620
aaattccgga tggggtggtg ctggaaaaca aggaaatcca tggccctgag gacctctaga 1680
gtcaccactt ggttttccag aaggaaacat attgagagta gtatttgatc ttgcactgga 1740
gaccccgagt atgttggtgt aatctttaca tatttggtta ggtaaataag tggacaattc 1800

cgtttgaagc atcttaaccc gaaccttggg aaggcgagga ttttacaatt ttgcttgttt 1860
gaaaagagag tgagaaacgc tgctaaacca gtgaggtcat ttaaatgtgc cgtctgctct 1920
ttctgctgta taagtacctg ttgaatgcca aaaaaaaaaa 1960

<210> 80
<211> 2045
<212> DNA
<213> Pinus radiata

<400> 80
gtgatctcgg cgccactggt tttgggtgag acatcttggt ttccagagcc cggcggtgga 60
catccgaaat tttcgtgact gcacatcttc ttcgcataat tcgccggaat atactctcat 120
tgctccgctc caactaaaca taaagggagg tggaggagga ggtggtggca acactacgat 180
tgatcggctg agaggattta tatgataatt cttcgctatt caacatagcg ttaacaggaa 240
gcataagtgc gtaacagttt cgtcttctac gcacgctctg atctgtccgc gacggggata 300
tttctatcac gaccgaaaat ggctgcagca ccagcagttg cttcacccgc agccgaaact 360
gatcggatcc ctaaacttca agccgaggtc acgaagctga accagatcag tgataatgag 420
aaggaagggt ttgtgcgact ggtttctcgc tacctcagcg gcgaagaaga gaagattgaa 480
tgggaaaaaa tcaagacccc gactgacgag atcgtggttc cctacgatac gttggcagct 540
ttgggagaag atccatcgga aaccaaggaa ctcttggaca agcttgttgt gttaaagctt 600
aatggcggtt tgggaacaac catgggttgt actgggccca aatccgtcat tgaagtacga 660
aatggcctaa catttctgga cttgattgtg aagcaaatag agtctctgaa caacaaatac 720
gattccaaag ttccgttggt gctgatgaat tcatttaata cacatgatga tacaattaag 780
attgtagaaa agtactctgg ctcaaatatt gacatccaca tcttcaacca gagtcaatat 840
ccacgcatgg tggcagaaga tttgacacca tggccaacta aaggtcgtac agacaaagaa 900
gcatggtacc cacctggcca cggagatgtt ttccccgctc ttttgaacag tgggaagctt 960
gatgaactac tctcacaggg taaggagtac gtgttcatag ctaactcaga caacttggga 1020
gcaatagttg atctcaaaat tttgaatcat ctggtcaaaa ataaaaatga atactgcatg 1080
gaggtcactc ccaaaacgct tgcagatgta aaaggtggta cacttatctc ttatgaaggc 1140
agagttcagc ttctagagat tgcacaggtt ccagaggagc atgttggcga attcaaggcg 1200
attgaaaagt tcaaaatctt caataccaat aatttatggg tgaacttgaa ggcgattaag 1260
aggcttgtgg aggctgatgc tcttaaaatg gagataattc ctaatccaaa ggaagtggat 1320
ggggtaaagg tgcttcagct tgaaacggct gcaggtgctg ctataaggtt ttttgatcgt 1380
gcaattggtg tcaatgttcc aagatcacgc tttctcccag tgaaggcaac ttcagattta 1440
ctacttgtgc agtcggatct ttacactgtg gaggaaggtt ttgtcatccg aaatcctgct 1500
agagtcaacc ctacaaatcc caccattgag ttgggtcctg aattcaagaa ggttggcaac 1560
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ggtgatgtgt ggtttggcag tggagtcatc ctgaagggaa aagttataat tgaagcaaag 1680
caggggggcta cacttgagat acctgatgaa tctgtgatag aaaacaaggt agtgagcagt 1740
cctgatgata ttgtgaacta gcttataagt tttggcagtt ggcattcttg atttttgggt 1800
tgtttgtaga gctagaatac tgtgtttagt gcccttaaag agtagggtgg aagtttcacc 1860
tctggtttta tcttccataa tccttactgg gaggggtttc ataattttat tataactagc 1920
cagtttctat gtaaatgttg agcgcgaatt tttatgcatg aaagcctagg atgaagcatc 1980
caaacacaat aaataaatgg tgctttgttg agattttta aaaaaaaaa aaaaaaaaa 2040
aaaaa 2045

<210> 81

<211> 139

<212> PRT

<213> Eucalyptus grandis

<400> 81

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Phe Asp Phe Ala Arg Gly Tyr Ser Pro Lys Tyr Val Lys Glu Tyr Ile
1               5                   10                  15
Glu Ser Ala Lys Pro Leu Phe Ser Val Gly Glu Tyr Trp Asp Ser Cys
            20                  25                  30
Asn Tyr Ser Gly Thr Thr Leu Glu Tyr Asn Gln Asp Ser His Arg Gln
        35                  40                  45
Arg Ile Val Asn Trp Ile Asp Gly Thr Gly Gln Leu Ser Ala Ala Phe
    50                  55                  60
Asp Phe Thr Thr Lys Gly Ile Leu Gln Glu Ala Val Lys Gly Gln Phe
65                  70                  75                  80
Trp Arg Leu Arg Asp Pro Lys Gly Lys Pro Pro Gly Val Met Gly Trp
                85                  90                  95
Trp Pro Ser Arg Ala Val Thr Phe Leu Asp Asn His Asp Thr Gly Ser
            100                 105                 110
Thr Gln Ala His Trp Pro Phe Pro Ser Asn His Ile Arg Arg Val Thr
        115                 120                 125
Arg Thr Tyr Ser Leu Ile Gln Glu Tyr Leu Leu
    130                 135
```

<210> 82
<211> 189
<212> PRT
<213> Eucalyptus grandis

<400> 82

```
Leu Phe Trp Leu Phe Val Leu Leu Val Phe Tyr Leu Ala Ala Ser Ala
1               5                   10                  15
Ser Pro Ala Leu Leu Phe Gln Gly Phe Asn Trp Glu Ser Trp Lys Lys
            20                  25                  30
Glu Gly Gly Trp Tyr Asn Ser Leu Lys Asn Leu Val Pro Asp Leu Ala
        35                  40                  45
Asn Ala Gly Ile Thr His Val Trp Leu Pro Pro Pro Ser Gln Ser Ala
    50                  55                  60
Ala Gln Gln Gly Tyr Leu Pro Gly Arg Leu Tyr Asp Leu Asn Ala Ser
65                  70                  75                  80
Ser Tyr Gly Asn Gln Asp Glu Leu Lys His Leu Ile Asp Ala Phe His
                85                  90                  95
Gln Lys Gly Ile Lys Cys Leu Ala Asp Ile Val Ile Asn His Arg Thr
            100                 105                 110
Ala Glu Lys Gln Asp Ser Arg Gly Ile Trp Cys Ile Phe Glu Gly Gly
        115                 120                 125
Thr Pro Asp Asp Arg Leu Asp Trp Gly Pro Ser Leu Ile Cys Arg Asp
    130                 135                 140
Asp Thr Glu Tyr Ser Asp Gly Arg Gly Asn Leu Asp Ser Gly Glu Asp
145                 150                 155                 160
Phe Lys Pro Ala Pro Asp Ile Asp His Leu Asn Pro Arg Val Gln Lys
                165                 170                 175
Glu Leu Ser Asp Trp Met Asn Trp Leu Lys Ser Asp Ile
            180                 185
```

<210> 83
<211> 176
<212> PRT
<213> Eucalyptus grandis

<400> 83

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Phe Gly Glu Phe Asn Thr Asp Glu Met Ala Gly Val Met Ala Ala Gly
1               5                   10                  15
Val Ala Asn Leu Asn Val Leu Gly Arg Glu Thr Ala Glu Phe Thr Ser
            20                  25                  30
Phe Arg Pro Val Phe Leu Arg Gly Asn Ser Gln Gly Leu Ser Ser Ala
        35                  40                  45
Ser Ser Leu Cys Asp Tyr Arg Ile Phe Ala Asp Ser Lys Arg Lys Lys
    50                  55                  60
His Ala Ile Phe Arg Lys Gln Asn Ile Asn Arg Ser Thr Val Val Ser
65                  70                  75                  80
Pro Arg Ala Val Ser Asp Thr Phe Ser Glu Leu Thr Cys Leu Asp Pro
                85                  90                  95
Val Ala Ser Arg Ser Val Leu Gly Ile Ile Leu Gly Gly Gly Ala Gly
            100                 105                 110
Thr Arg Leu Tyr Pro Leu Thr Lys Lys Arg Ala Lys Pro Ala Val Pro
        115                 120                 125
Leu Gly Ala Asn Tyr Arg Leu Ile Asp Ile Pro Val Ser Asn Cys Ile
    130                 135                 140
Asn Ser Asn Ile Ser Lys Ile Tyr Val Leu Thr Gln Phe Asn Ser Ala
145                 150                 155                 160
Ser Leu Asn Pro Ser Ser Phe Thr Gly Leu Phe Lys His Met Gly Ser
                165                 170                 175
```

<210> 84
<211> 47
<212> PRT
<213> Eucalyptus grandis

<400> 84

```
Asp Pro Ala Leu Asp Ser Ala Asp Ala Phe Lys Ser Val Arg Arg Asp
1               5                   10                  15
Pro Asp Val Val Ser Pro Arg Asp Val Ser Asp Ser Arg Asn Ser Gln
            20                  25                  30
Thr Cys Leu Asn Pro Asp Ala Ser Arg Ser Val Leu Gly Ile Ile
        35                  40                  45
```

<210> 85
<211> 146
<212> PRT
<213> Eucalyptus grandis

<400> 85

```
Ala Pro Ala Leu Ala Ser Gly Ala Ala Ala Phe Lys Ser Val Arg Arg
1               5                   10                  15
Ala Pro Ala Val Val Ser Pro Arg Ala Val Ser Asp Ser Arg Asn Ser
            20                  25                  30
Gln Thr Cys Leu Asp Pro Asp Ala Ser Arg Ser Val Leu Gly Ile Ile
        35                  40                  45
Leu Gly Gly Gly Ala Gly Thr Arg Leu Tyr Pro Leu Thr Lys Lys Arg
    50                  55                  60
Ala Lys Pro Ala Val Pro Leu Gly Ala Asn Tyr Arg Leu Ile Asp Ile
65                  70                  75                  80
Pro Val Ser Asn Cys Leu Asn Ser Asn Val Ser Lys Ile Tyr Val Leu
                85                  90                  95
Thr Gln Phe Asn Ser Ala Ser Leu Asn Arg His Leu Ser Arg Ala Tyr
            100                 105                 110
```

Ala Ser Asn Met Gly Gly Tyr Lys Asn Glu Gly Phe Val Glu Val Leu
115 120 125
Ala Ala Gln Gln Ser Pro Glu Asn Pro Asn Trp Phe Gln Gly Thr Ala
130 135 140
Asp Ala
145

<210> 86
<211> 84
<212> PRT
<213> Eucalyptus grandis

<400> 86
Glu Leu Thr Ala Met Asp Ser Arg Cys Val Ala Leu Lys Ala Asn Ala
1 5 10 15
Ser Leu Ala Gln Ser Asn Lys Ser Cys Leu Lys Asn Val Asp Lys Gly
20 25 30
Phe Leu Gly Glu Arg Ile Arg Gly Ser Leu Asp Asn Ser Val Trp Val
35 40 45
Lys Gln Val Ala Arg Asn Leu Arg Val Glu Lys Lys Phe Lys Lys Ala
50 55 60
Lys Pro Gly Val Ala Phe Ala Val Ile Thr Ser Asn Thr Val Ala Glu
65 70 75 80
Thr Leu Thr Ile

<210> 87
<211> 113
<212> PRT
<213> Eucalyptus grandis

<400> 87
Lys Ile Phe Ile Leu Thr Gln Phe Asn Ser Phe Ser Leu Asn Arg His
1 5 10 15
Leu Ser Arg Thr Tyr Asn Phe Asp Asn Gly Val Ser Phe Gly Asp Gly
20 25 30
Phe Val Glu Val Leu Ala Ala Thr Gln Thr Pro Gly Glu Ala Gly Lys
35 40 45
Arg Trp Phe Gln Gly Thr Ala Asp Ala Val Arg Gln Phe Ile Trp Val
50 55 60
Phe Glu Asp Ala Lys Asn Lys Asn Val Glu Asn Ile Leu Ile Leu Ser
65 70 75 80
Gly Asp His Leu Tyr Arg Met Asn Tyr Met Asp Phe Val Gln Lys His
85 90 95
Ile Asp Ser Asn Ala Asp Ile Thr Val Ser Cys Val Pro Met Asp Asp
100 105 110
Ser

<210> 88
<211> 131
<212> PRT
<213> Eucalyptus grandis

<400> 88
Ala Ile Ser Val Ala Cys Thr Pro Val Gly Glu Ser Arg Ala Ser Asp
1 5 10 15

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Tyr Gly Leu Val Lys Ile Asp Ser Arg Gly Gln Ile Val Gln Phe Ser
            20                  25                  30
Glu Lys Pro Lys Gly Pro Asp Leu Thr Ala Met Gln Val Asp Thr Thr
        35                  40                  45
Thr Leu Gly Leu Ser Pro Gln Glu Ala Ala Arg Ser Pro Tyr Ile Ala
    50                  55                  60
Ser Met Gly Val Tyr Ala Phe Lys Thr Glu Ser Leu Leu Asn Leu Leu
65                  70                  75                  80
Lys Trp Arg Tyr Pro Thr Ala Asn Asp Phe Gly Ser Glu Ile Ile Pro
                85                  90                  95
Ser Ala Val Met Glu Gln Asp Val Gln Ala Tyr Ile Phe Arg Asp Tyr
            100                 105                 110
Trp Glu Asp Ile Gly Thr Ile Lys Ser Phe Tyr Asp Ala Asn Leu Ala
        115                 120                 125
Leu Thr Glu
    130

      <210> 89
      <211> 115
      <212> PRT
      <213> Eucalyptus grandis

      <400> 89
Arg Leu Ser Ser Lys Phe Ile Trp Val Trp Leu Leu Leu Arg Trp Val
 1               5                  10                  15
Arg Phe Val Gly Met Asp Ser Cys Phe Ala Ser Met Lys Val Gly Ala
            20                  25                  30
Arg Pro Val Pro Gly Gly Gly Ile Ile Asn Phe Ser Glu Phe Trp Gly
        35                  40                  45
Glu Asn Leu Arg Val Gly Ala Asn Lys Gln Phe Gly Ala Arg Leu Cys
    50                  55                  60
Lys Ser Leu Arg Ser Glu Thr Arg Ile Gly Arg Val Lys Pro Gly Ile
65                  70                  75                  80
Ala Tyr Ser Val Leu Thr Pro Glu Val Asp Lys Glu Thr Met Thr Leu
                85                  90                  95
Gln Ala Pro Val Leu Glu Thr Pro Arg Ala Asp Pro Lys Ser Phe Ala
            100                 105                 110
Ser Ile Ile
        115

      <210> 90
      <211> 600
      <212> PRT
      <213> Eucalyptus grandis

      <400> 90
Pro Gly Met Ile Gln Val Tyr Leu Gly Ser Ala Gly Ala Leu Asp Val
 1               5                  10                  15
Glu Gly Lys Glu Leu Pro Arg Leu Val Tyr Val Ser Arg Glu Lys Arg
            20                  25                  30
Pro Gly Tyr Gln His His Lys Lys Ala Gly Ala Met Asn Ala Leu Val
        35                  40                  45
Arg Val Ser Ala Val Leu Thr Asn Ala Pro Phe Leu Leu Asn Leu Asp
    50                  55                  60
Cys Asp His Tyr Ile Asn Asn Ser Lys Ala Ile Arg Glu Ala Met Cys
65                  70                  75                  80
Phe Leu Met Asp Pro Gln Leu Gly Lys Lys Leu Cys Tyr Val Gln Phe
```

85 90 95
Pro Gln Arg Phe Asp Gly Ile Asp Arg His Asp Arg Tyr Ala Asn Arg
100 105 110
Asn Ile Val Phe Phe Asp Ile Asn Met Arg Gly Leu Asp Gly Ile Gln
115 120 125
Gly Pro Val Tyr Val Gly Thr Gly Cys Val Phe Asn Arg Gln Ala Leu
130 135 140
Tyr Gly Tyr Asp Pro Pro Val Ser Gln Lys Arg Pro Lys Met Thr Cys
145 150 155 160
Asp Cys Trp Pro Ser Trp Cys Ser Cys Cys Cys Gly Gly Ser Arg Lys
165 170 175
Ser Lys Ser Lys Lys Lys Asp Asp Thr Ser Leu Leu Gly Pro Val His
180 185 190
Ala Lys Lys Lys Lys Met Thr Gly Lys Asn Tyr Leu Lys Lys Lys Gly
195 200 205
Ser Gly Pro Val Phe Asp Leu Glu Asp Ile Glu Glu Gly Leu Glu Gly
210 215 220
Phe Asp Glu Leu Glu Lys Ser Ser Leu Met Ser Gln Lys Asn Phe Glu
225 230 235 240
Lys Arg Phe Gly Gln Ser Pro Val Phe Ile Ala Ser Thr Leu Met Glu
245 250 255
Asp Gly Gly Leu Pro Glu Gly Thr Asn Ser Thr Ser Leu Ile Lys Glu
260 265 270
Ala Ile His Val Ile Ser Cys Gly Tyr Glu Glu Lys Thr Glu Trp Gly
275 280 285
Lys Glu Ile Gly Trp Ile Tyr Gly Ser Val Thr Glu Asp Ile Leu Thr
290 295 300
Gly Phe Lys Met His Cys Arg Gly Trp Lys Ser Val Tyr Cys Met Pro
305 310 315 320
Lys Arg Pro Ala Phe Lys Gly Ser Ala Pro Ile Asn Leu Ser Asp Arg
325 330 335
Leu His Gln Val Leu Arg Trp Ala Leu Gly Ser Val Glu Ile Phe Leu
340 345 350
Ser Arg His Cys Pro Leu Trp Tyr Ala Trp Gly Gly Lys Leu Lys Leu
355 360 365
Leu Glu Arg Leu Ala Tyr Ile Asn Thr Ile Val Tyr Pro Phe Thr Ser
370 375 380
Ile Pro Leu Leu Phe Tyr Cys Thr Ile Pro Ala Val Cys Leu Leu Thr
385 390 395 400
Gly Lys Phe Ile Ile Pro Thr Leu Thr Asn Phe Ala Ser Ile Trp Phe
405 410 415
Leu Ala Leu Phe Leu Ser Ile Ile Ala Thr Gly Val Leu Glu Leu Arg
420 425 430
Trp Ser Gly Val Ser Ile Glu Asp Trp Trp Arg Asn Glu Gln Phe Trp
435 440 445
Val Ile Gly Gly Val Ser Ala His Leu Phe Ala Val Phe Gln Gly Leu
450 455 460
Leu Lys Val Leu Ala Gly Val Asp Thr Asn Phe Thr Val Thr Ala Lys
465 470 475 480
Ala Ala Glu Asp Ser Glu Phe Gly Glu Leu Tyr Leu Phe Lys Trp Thr
485 490 495
Thr Leu Leu Ile Pro Pro Thr Thr Leu Ile Ile Leu Asn Met Val Gly
500 505 510
Val Val Ala Gly Val Ser Asp Ala Ile Asn Asn Gly Tyr Gly Ser Trp
515 520 525
Gly Pro Leu Phe Gly Lys Leu Phe Phe Ala Phe Trp Val Ile Val His
530 535 540

Leu Tyr Pro Phe Leu Lys Gly Leu Met Gly Lys Gln Asn Arg Thr Pro
545 550 555 560
Thr Ile Val Val Leu Trp Ser Val Leu Leu Ala Ser Ile Phe Ser Leu
565 570 575
Val Trp Val Arg Ile Asp Pro Phe Leu Pro Lys Gln Thr Gly Pro Val
580 585 590
Leu Lys Pro Cys Gly Val Glu Cys
595 600

<210> 91
<211> 222
<212> PRT
<213> Pinus radiata

<400> 91
Pro Asn Glu Phe Pro Leu Tyr Thr Thr Leu Glu Lys Lys Ser Leu Leu
1 5 10 15
Tyr Arg Ala Tyr Ser Cys Thr His Phe Cys Ala Ile Ile Gly Leu Ile
20 25 30
Cys Tyr Arg Leu Leu Tyr Ile Pro Ser Glu Asp Ser Trp Ser Trp Ile
35 40 45
Leu Ile Phe Val Ala Glu Leu Gly Phe Ser Tyr Ser Trp Ile Leu Asp
50 55 60
Gln Ala Leu Arg Trp Trp Pro Val Gln Arg Thr Val Phe Pro Lys Arg
65 70 75 80
Leu Ser Lys Arg Phe Gln Ser Asn Leu Pro Pro Val Asp Ile Phe Ile
85 90 95
Cys Thr Ala Asp Pro Phe Lys Glu Pro Pro Leu Thr Val Ile Asn Thr
100 105 110
Val Leu Ser Ala Leu Ala Val His Tyr Pro Met Gly Lys Leu Ser Cys
115 120 125
Tyr Val Ser Asp Asp Gly Gly Ser Pro Leu Thr Phe Tyr Ala Leu Leu
130 135 140
Glu Ala Ser Arg Phe Ala Lys Ile Trp Ile Pro Phe Cys Asp Lys Tyr
145 150 155 160
Ser Ile Glu Asp Arg Cys Pro Glu Val Tyr Phe Ser Asn Pro Ser Ala
165 170 175
Leu Glu Asn Val Asn Leu Ser Phe Met Thr Asp Trp Arg His Val Asn
180 185 190
Lys Met Tyr Phe Glu Leu Lys Asp Arg Ile Asn Asn Val Met Glu Met
195 200 205
Gly Ser Val His Gln Ile Asn Arg Met Asn Thr Lys Asp Ser
210 215 220

<210> 92
<211> 121
<212> PRT
<213> Pinus radiata

<400> 92
Ser Lys Leu Leu Met Glu Pro Asn Asp Phe Pro Leu Tyr Thr Thr Leu
1 5 10 15
Glu Lys Lys Ser Leu Leu Tyr Arg Ala Tyr Ser Cys Thr His Phe Ser
20 25 30
Ala Ile Ile Gly Leu Ile Cys Tyr Arg Leu Leu Tyr Ile Pro Ser Glu
35 40 45
Asp Ser Trp Pro Trp Ile Leu Ile Phe Val Ala Glu Leu Gly Phe Ser

50 55 60
Tyr Ser Trp Ile Leu Asp Gln Ala Leu Arg Trp Trp Pro Val Glu Arg
65 70 75 80
Thr Val Phe Pro Asn Arg Leu Ser Lys Arg Phe Gln Ser Lys Leu Pro
85 90 95
Pro Val Asp Ile Phe Ile Cys Thr Ala Asp Pro Phe Lys Glu Pro Pro
100 105 110
Leu Thr Val Ile Asn Thr Val Leu Ser
115 120

<210> 93
<211> 603
<212> PRT
<213> Pinus radiata

<400> 93
Leu Lys Phe Phe Glu Phe Gly Arg Glu Leu Asn Leu Thr Met Glu Ala
1 5 10 15
Ser Ala Gly Leu Val Ala Gly Ser His Asn Arg Asn Glu Phe Val Val
20 25 30
Ile His Gly His Glu Glu Pro Lys Pro Leu Asn Thr Leu Ser Gly His
35 40 45
Val Cys Gln Ile Cys Gly Glu Asp Val Gly Leu Asn Thr Asp Gly Glu
50 55 60
Leu Phe Val Ala Cys Asn Glu Cys Gly Phe Pro Val Cys Arg Pro Cys
65 70 75 80
Tyr Glu Tyr Glu Arg Arg Glu Gly Asn Gln Ser Cys Pro Gln Cys Asn
85 90 95
Thr Arg Tyr Lys Arg Gln Lys Gly Ser Pro Arg Val Glu Gly Asp Asp
100 105 110
Asp Glu Glu Asp Val Asp Asp Ile Glu His Glu Phe Asn Val Glu Thr
115 120 125
Gln Gln Arg Asn Arg Gln Gln Ile Thr Glu Ala Met Leu His Gly Arg
130 135 140
Met Ser Tyr Gly Arg Gly Pro Asp Asp Glu Asn Ser Gln Ile Ala His
145 150 155 160
Asn Pro Glu Leu Pro Pro Gln Ile Pro Val Leu Ala Asn Gly His Ser
165 170 175
Val Val Ser Gly Glu Ile Pro Thr Ser Tyr Tyr Ala Asp Asn Gln Leu
180 185 190
Leu Ala Asn Pro Ala Met Leu Lys Arg Val His Pro Ser Ser Glu Pro
195 200 205
Gly Ser Gly Arg Ile Ile Met Asp Pro Asn Arg Asp Ile Gly Ser Tyr
210 215 220
Gly Phe Gly Asn Val Ser Trp Lys Glu Arg Gly Asp Gly Tyr Lys Ser
225 230 235 240
Lys Glu Asn Lys Ser Gly Gln Leu Asp Met Thr Glu Gly Arg Tyr Gln
245 250 255
Tyr Asn Gly Gly Phe Ala Pro Asn Glu Pro Glu Asp Tyr Ile Asp Pro
260 265 270
Asp Met Pro Met Thr Asp Glu Ala Arg Gln Pro Leu Ser Arg Lys Val
275 280 285
Pro Ile Pro Ser Ser Lys Ile Asn Pro Tyr Arg Met Val Ile Val Ile
290 295 300
Arg Leu Ile Val Leu Gly Ile Phe Leu Arg Tyr Arg Leu Leu Asn Pro
305 310 315 320
Val Lys Asn Ala Tyr Gly Leu Trp Ala Thr Ser Ile Val Cys Glu Ile

```
                325                     330                     335
Trp Phe Ala Leu Ser Trp Ile Leu Asp Gln Phe Pro Lys Trp Leu Pro
            340                     345                     350
Ile Ser Arg Glu Thr Tyr Leu Asp Arg Leu Ser Leu Arg Tyr Glu Arg
        355                     360                     365
Glu Gly Glu Pro Ser Met Leu Ala Pro Val Asp Leu Phe Val Ser Thr
    370                     375                     380
Val Asp Pro Leu Lys Glu Pro Pro Leu Val Thr Ala Asn Thr Val Leu
385                     390                     395                     400
Ser Ile Leu Ser Val Asp Tyr Pro Val Asp Asn Val Ser Cys Tyr Val
                405                     410                     415
Ser Asp Asp Gly Ala Ser Met Leu Thr Phe Glu Ser Leu Ser Glu Thr
            420                     425                     430
Ser Glu Phe Ala Arg Lys Trp Val Pro Phe Cys Lys Lys Phe Asp Ile
        435                     440                     445
Glu Pro Arg Ala Pro Glu Ile Tyr Phe Ser Gln Lys Ile Asp Tyr Leu
    450                     455                     460
Lys Asp Lys Phe Gln Pro Thr Phe Val Lys Glu Arg Arg Ala Met Lys
465                     470                     475                     480
Arg Glu Tyr Glu Glu Phe Lys Val Arg Ile Asn Arg Leu Val Ala Lys
                485                     490                     495
Ala Ser Lys Val Pro Lys Glu Gly Trp Thr Met Gln Asp Gly Thr Pro
            500                     505                     510
Trp Pro Gly Asn Asn Thr Arg Asp His Pro Gly Met Ile Gln Val Phe
        515                     520                     525
Leu Gly His Ser Gly Gly Leu Asp Thr Glu Gly Asn Glu Leu Pro Arg
    530                     535                     540
Leu Val Tyr Val Ser Arg Glu Lys Arg Pro Gly Phe Gln His His Lys
545                     550                     555                     560
Lys Ala Gly Ala Met Asn Ala Leu Val Arg Val Ser Ala Val Leu Thr
                565                     570                     575
Asn Ala Pro Phe Met Leu Asn Leu Asp Cys Asp His Tyr Ile Asn Asn
            580                     585                     590
Ser Lys Ala Ile Arg Glu Gly Met Cys Phe Met
        595                     600
```

<210> 94
<211> 245
<212> PRT
<213> Pinus radiata

<400> 94

```
Asn His Ile Lys Leu Leu Pro Phe Ala Gln Glu Gln Asn Asp Glu Ile
 1               5                  10                  15
Met Glu Ala Arg Ala Gly Leu Val Ala Gly Ser Tyr Lys Arg Asn Glu
            20                  25                  30
Leu Met Val Val Pro Gly His Asp Gly Pro Lys Pro Ile Arg Leu Ser
        35                  40                  45
Thr Leu Gln Asp Cys Gln Val Cys Gly Asp Lys Ile Gly Cys Asn Pro
    50                  55                  60
Asn Gly Glu Leu Phe Val Ala Cys Asn Glu Cys Gly Phe Pro Val Cys
65                  70                  75                  80
Arg Pro Cys Tyr Glu Tyr Glu Arg Lys Asp Gly Asn Arg Cys Cys Pro
                85                  90                  95
Gln Cys Lys Thr Arg Tyr Arg Arg His Lys Gly Ser Pro Arg Val Glu
            100                 105                 110
Gly Asp Asp Glu Glu Asp Gly Met Asp Asp Leu Glu Gln Glu Phe Asn
```

```
        115                 120                 125
Met Glu Arg Asp Arg Gln Ser Val Val Ser His Arg Gly Asn Ala Phe
    130                 135                 140
Asp Ala Thr Pro Arg Ala Ala His Ser Ile Ala Asn Arg Ser Ile Asn
145                 150                 155                 160
Gly Asp Asn Tyr Ala Leu Ser Leu Pro Pro Ile Met Asp Gly Asp Ser
                165                 170                 175
Leu Ser Val Gln Arg Phe Pro His Ala Ala Thr Val Ile Gly Asn Gly
            180                 185                 190
Leu Asp Pro Val Lys Glu Asn Tyr Gly Ser Ala Ala Trp Lys Glu Arg
        195                 200                 205
Val Glu Asn Trp Lys Ala Lys His Asp Lys Lys Ser Gly Ser Ile Lys
    210                 215                 220
Asp Gly Ile Tyr Asp Pro Asp Glu Ala Asp Asp Ile Met Met Thr Glu
225                 230                 235                 240
Ala Glu Ala Arg Gln
                245
```

<210> 95
<211> 149
<212> PRT
<213> Eucalyptus grandis

<400> 95

```
Leu Glu Arg Val Ser Gly Thr Glu His Ser His Ile Leu Arg Val Pro
 1               5                  10                  15
Phe Arg Ser Asp Gln Gly Ile Leu Arg Lys Trp Ile Ser Arg Phe Asp
            20                  25                  30
Val Trp Pro Tyr Leu Glu Thr Phe Ala Leu Asp Ala Ala His Glu Ile
        35                  40                  45
Thr Ala Glu Leu Gln Gly Phe Pro Asp Phe Ile Ile Gly Asn Tyr Ser
    50                  55                  60
Asp Gly Asn Leu Val Ala Ser Leu Leu Ala Tyr Lys Met Gly Val Thr
65                  70                  75                  80
Gln Cys Thr Ile Ala His Ala Leu Glu Lys Thr Lys Tyr Pro Asp Ser
                85                  90                  95
Asp Ile Tyr Trp Lys Lys Phe Asp Glu Lys Tyr His Phe Ser Cys Gln
            100                 105                 110
Phe Thr Ala Asp Leu Leu Ala Met Asn Asn Ala Asp Phe Ile Ile Thr
        115                 120                 125
Ser Thr Tyr Gln Glu Ile Ala Gly Thr Lys Asn Thr Val Gly Gln Tyr
    130                 135                 140
Glu Ser His Thr Ala
145
```

<210> 96
<211> 124
<212> PRT
<213> Eucalyptus grandis

<400> 96

```
Leu Ala Lys Ala Gly Thr Lys Asn Thr Val Gly Gln Tyr Glu Ser His
 1               5                  10                  15
Thr Ala Phe Thr Leu Pro Gly Leu Tyr Arg Val Val His Gly Ile Asp
            20                  25                  30
Val Phe Asp Pro Lys Phe Asn Ile Val Ser Pro Gly Ala Asp Met Cys
        35                  40                  45
```

```
Ile Tyr Phe Pro Tyr Ser Glu Lys Gln Lys Arg Leu Thr Ala Leu His
    50                  55                  60
Gly Ser Ile Glu Lys Leu Leu Tyr Asp Pro Glu Gln Asn Asp Glu His
65                  70                  75                  80
Ile Gly Ser Leu Ser Asp Arg Ser Lys Pro Met Ile Phe Ser Met Ala
                85                  90                  95
Arg Leu Asp Lys Val Lys Asn Met Thr Gly Leu Val Glu Cys Tyr Ala
            100                 105                 110
Lys Asn Ser Lys Leu Arg Glu Leu Ala Asn Leu Val
        115                 120

      &lt;210&gt; 97
      &lt;211&gt; 61
      &lt;212&gt; PRT
      &lt;213&gt; Eucalyptus grandis

      &lt;400&gt; 97
Glu Ala Ile Val Leu Pro Pro Phe Val Ala Ile Ala Val Arg Pro Arg
 1               5                  10                  15
Pro Gly Val Trp Glu Tyr Val Arg Val Asn Val His Glu Leu Ser Val
            20                  25                  30
Glu Gln Leu Thr Val Ser Glu Tyr Leu Gly Phe Lys Glu Glu Leu Val
        35                  40                  45
Asp Gly Lys Ser Glu Asp Ser Phe Val Leu Glu Leu Asp
    50                  55                  60

      &lt;210&gt; 98
      &lt;211&gt; 217
      &lt;212&gt; PRT
      &lt;213&gt; Pinus radiata

      &lt;400&gt; 98
Cys Val Gly Ile Asp Pro Lys Ala Asn Met Val Ser Ala Arg Leu Thr
 1               5                  10                  15
Arg Ser Leu Ser Ser Arg Glu Arg Val Glu Asp Thr Leu Ser Glu His
            20                  25                  30
Arg Asn Gln Leu Ala Ala Leu Phe Ser Arg Tyr Val Ala Gln Gly Lys
        35                  40                  45
Lys Val Leu Gln Pro His Glu Ile Leu Asp Gly Leu Ala Ala Val Ile
    50                  55                  60
Gly Glu Asn Asp Glu His Gln Asn Phe Arg Asp Gly Leu Phe Gly Asn
65                  70                  75                  80
Val Leu Arg Ser Thr Gln Glu Ala Ile Ile Ile Pro Pro Trp Val Val
                85                  90                  95
Leu Ala Val Arg Pro Arg Pro Gly Val Trp Glu Phe Val Arg Val Asn
            100                 105                 110
Val Asp Glu Leu Ala Val Glu Gln Leu Ser Val Ala Glu Tyr Leu Glu
        115                 120                 125
Phe Lys Glu Gln Leu Val Asp Gly Ser Val Lys Asp Asn Tyr Val Leu
    130                 135                 140
Glu Leu Asp Leu Glu Pro Phe Asn Ala Ser Phe Pro Arg Pro Thr Gln
145                 150                 155                 160
Pro Ser Ser Ile Gly Ser Gly Val Gln Phe Leu Asn Arg His Leu Ser
                165                 170                 175
Ser Arg Leu Phe Arg Asp His Glu Ser Met Gln Pro Leu Leu Asp Phe
            180                 185                 190
Leu Arg Ala His Lys Tyr Gln Gly Gln Arg Leu Met Leu Asn Glu Arg
```

195 200 205
Ile Gln Ser Leu Thr Lys Leu Arg Ser
210 215

<210> 99
<211> 348
<212> PRT
<213> Pinus radiata

<400> 99
Gly Thr Lys Ser Trp Ser Ser Arg Ala Cys Arg Ser Thr Leu Val Asp
1 5 10 15
Pro Lys Asn Ser Ala Arg Asp Gly Ile Asp Val Phe Asp Pro Lys Phe
20 25 30
Asn Ile Val Ser Pro Gly Ala Asp Met Gln Ile Tyr Phe Pro Tyr Thr
35 40 45
Glu Lys Gln His Arg Leu Thr Thr Leu His Gly Thr Ile Glu Glu Leu
50 55 60
Leu Phe Ser Pro Glu Gln Thr Ala Glu His Met Cys Ala Leu Asn Asp
65 70 75 80
Arg Lys Lys Pro Ile Ile Phe Ser Met Ala Arg Leu Asp Arg Val Lys
85 90 95
Asn Met Thr Gly Leu Val Glu Trp Phe Ala Lys Ser Lys Arg Leu Arg
100 105 110
Glu Leu Val Asn Leu Val Val Val Ala Gly Asp Ile Asp Pro Ser Lys
115 120 125
Ser Lys Asp Arg Glu Glu Val Ala Glu Ile Glu Lys Met His Arg Leu
130 135 140
Val Lys Glu Tyr Asn Leu Asn Gly Gln Phe Arg Trp Ile Cys Ala Gln
145 150 155 160
Lys Asn Arg Val Arg Asn Gly Glu Leu Tyr Arg Tyr Ile Cys Asp Thr
165 170 175
Arg Gly Ala Phe Val Gln Pro Ala Leu Tyr Glu Ala Phe Gly Leu Thr
180 185 190
Val Val Glu Ala Met Thr Cys Gly Leu Pro Thr Phe Ala Thr Cys Asn
195 200 205
Gly Gly Pro Ala Glu Ile Ile Val Asp Gly Val Ser Gly Phe His Ile
210 215 220
Asp Pro Tyr His Gly Val Ser Ala Thr Glu Arg Ile Ala Asp Phe Phe
225 230 235 240
Glu Lys Cys Lys Thr Asp Pro Ser His Trp Glu Lys Ile Ser Asn Gly
245 250 255
Gly Leu Gln Arg Ile Tyr Glu Lys Tyr Thr Trp Gln Ile Tyr Ala Asp
260 265 270
Arg Leu Met Thr Leu Ser Gly Val Tyr Gly Phe Trp Lys Tyr Val Ser
275 280 285
Lys Leu Glu Arg Arg Glu Thr Arg Arg Tyr Leu Glu Met Phe Tyr Ser
290 295 300
Leu Lys Tyr Arg Asn Leu Val Lys Thr Val Pro Leu Ala Val Glu Glu
305 310 315 320
Ser Val Asn Gly Ile Glu Glu Lys Ser Thr Glu Phe Arg Trp Leu His
325 330 335
Ser Cys Arg Ser Cys Arg Pro Arg His Phe Ala Gln
340 345

<210> 100
<211> 139

<212> PRT
<213> Pinus radiata

<400> 100
Ser Asn Leu Glu Thr Phe Leu Gly Arg Val Pro Met Val Phe Asn Val
1 5 10 15
Val Ile Leu Ser Pro His Gly Tyr Phe Gly Gln Ala Asn Val Leu Gly
20 25 30
Met Pro Asp Thr Gly Gly Gln Val Val Tyr Ile Leu Asp Gln Cys Arg
35 40 45
Ala Leu Glu Asn Glu Met Leu Leu Arg Ile Lys Gln Gln Gly Leu Asp
50 55 60
Ile Thr Pro Glu Ile Ile Val Val Thr Arg Leu Ile Pro Glu Ala His
65 70 75 80
Gly Thr Thr Cys Asn Gln Arg Leu Glu Lys Ile Ser Gly Thr Gln His
85 90 95
Ser Arg Ile Leu Arg Val Pro Phe Arg Thr Glu Lys Gly Val Val Arg
100 105 110
Asp Trp Val Ser Arg Phe Asp Val Trp Pro Tyr Leu Glu Arg Phe Ser
115 120 125
Glu Asp Val Thr Asn Glu Ile Ala Val Glu Leu
130 135

<210> 101
<211> 68
<212> PRT
<213> Pinus radiata

<400> 101
Ile Leu Leu Leu Ile Val Gly Ile Gly Ile His Ile Lys Ala Lys Glu
1 5 10 15
Asn Met Val Ala Ala Ala Leu Thr His Ala Leu Ser Ser Arg Glu Arg
20 25 30
Val Glu Asp Met Leu Ser Glu His Arg Asn Glu Ile Val Ser Leu Leu
35 40 45
Ser Arg Tyr Val Ala Glu Gly Lys Lys Ile Leu Gln Pro His Gln Leu
50 55 60
Leu Asp Gly Leu
65

<210> 102
<211> 70
<212> PRT
<213> Eucalyptus grandis

<400> 102
Met Ala Ala Pro Lys Leu Gly Arg Ile Pro Ser Ile Arg Asp Arg Val
1 5 10 15
Glu Asp Thr Leu Ala Ala His Arg Asn Glu Leu Val Ser Leu Leu Ser
20 25 30
Arg Tyr Val Ala Gln Gly Lys Gly Ile Leu Gln Pro His His Leu Leu
35 40 45
Asp Glu Leu Glu Asn Ile Ile Ser Glu Asp Glu Gly Lys Ser Ser Leu
50 55 60
Ser Asp Gly Pro Phe Ser
65 70

<210> 103
<211> 534
<212> PRT
<213> Eucalyptus grandis

<400> 103
Val Leu Phe Thr His Leu Pro Pro Gln Lys Pro Asn Arg Ile Ser Leu
1 5 10 15
Leu Leu Phe Phe Ile Phe His Ile Thr Thr Phe Leu Leu Leu Leu Leu
20 25 30
Leu Leu Ser Val Leu Ser Thr Phe Ile Ser Ile Ala Val Ser Leu Ser
35 40 45
Asp Pro Glu Leu Phe Phe Ala Ser Pro Pro Met Ala Ala Ala Ala Thr
50 55 60
Leu Ser Ala Pro Asp Ala Ala Lys Leu Ser Gln Leu Lys Ser Ala Val
65 70 75 80
Ser Gly Leu Gly Gln Ile Ser Glu Ser Glu Lys Asn Gly Phe Ile Asn
85 90 95
Leu Val Ser Arg Tyr Leu Ser Gly Glu Ala Gln His Val Asp Trp Ser
100 105 110
Lys Ile Gln Thr Pro Thr Asp Glu Ile Val Val Pro Tyr Asp Ser Leu
115 120 125
Ala Pro Thr Pro Gln Asp Pro Ala Ala Thr Lys Ser Leu Leu Asp Lys
130 135 140
Leu Val Val Leu Lys Leu Asn Gly Gly Leu Gly Thr Thr Met Gly Cys
145 150 155 160
Thr Gly Pro Lys Ser Val Ile Glu Val Arg Asn Gly Leu Thr Phe Leu
165 170 175
Asp Leu Ile Val Ile Gln Ile Glu Asn Leu Asn Thr Lys Tyr Gly Cys
180 185 190
Asn Val Pro Leu Leu Leu Met Asn Ser Phe Asn Thr His Asp Asp Thr
195 200 205
Leu Lys Ile Val Glu Lys Tyr Ala Asn Ser Asn Ile Asp Ile His Thr
210 215 220
Phe Asn Gln Ser Gln Tyr Pro Arg Leu Val Val Glu Asp Phe Met Pro
225 230 235 240
Leu Pro Cys Lys Gly Gln Thr Gly Lys Asp Gly Trp Tyr Pro Pro Gly
245 250 255
His Gly Asp Val Phe Ala Ser Leu Met Asn Ser Gly Lys Leu Asp Ala
260 265 270
Leu Leu Ser Gln Gly Lys Glu Tyr Val Phe Ala Ala Asn Ser Asp Asn
275 280 285
Leu Gly Ala Ile Val Asp Leu Lys Ile Leu Asn His Leu Met Thr Asn
290 295 300
Lys Asn Glu Tyr Cys Met Glu Val Thr Pro Lys Thr Leu Ala Asp Val
305 310 315 320
Lys Gly Gly Thr Leu Ile Ser Tyr Glu Gly Lys Val Gln Leu Leu Glu
325 330 335
Ile Ala Gln Val Pro Asp Glu His Ile Asn Glu Phe Lys Ser Ile Glu
340 345 350
Lys Phe Lys Ile Phe Asn Thr Asn Asn Leu Trp Val Asn Leu Lys Ala
355 360 365
Ile Lys Arg Leu Val Glu Ala Gln Ala Leu Lys Met Glu Ile Ile Pro
370 375 380
Asn Pro Lys Glu Val Asp Gly Ile Lys Val Leu Gln Leu Glu Thr Ala
385 390 395 400
Ala Gly Ala Ala Ile Lys Phe Phe Asp Asn Ala Ile Gly Ile Asn Val

```
                405                     410                     415
Pro Arg Ser Arg Phe Leu Pro Val Lys Ala Thr Ser Asp Leu Leu Leu
            420                     425                     430
Val Gln Ser Asp Leu Tyr Thr Leu Val Asp Gly Phe Val Glu Arg Asn
        435                     440                     445
Lys Ala Arg Thr Asn Pro Ser Asn Pro Ser Ile Glu Leu Gly Pro Glu
    450                     455                     460
Phe Lys Lys Val Gly Asn Phe Leu Ser Arg Phe Lys Ser Ile Pro Ser
465                     470                     475                     480
Ile Ile Glu Leu Asp Ser Leu Lys Val Ser Gly Asp Val Trp Phe Gly
                485                     490                     495
Thr Gly Ile Thr Leu Lys Gly Lys Val Thr Ile Ala Ala Lys Pro Gly
            500                     505                     510
Val Lys Leu Glu Ile Pro Asp Gly Val Val Leu Glu Asn Lys Glu Ile
        515                     520                     525
His Gly Pro Glu Asp Leu
    530

      <210> 104
      <211> 480
      <212> PRT
      <213> Pinus radiata

      <400> 104
Met Ala Ala Ala Pro Ala Val Ala Ser Pro Ala Ala Glu Thr Asp Arg
 1               5                  10                  15
Ile Pro Lys Leu Gln Ala Glu Val Thr Lys Leu Asn Gln Ile Ser Asp
            20                  25                  30
Asn Glu Lys Glu Gly Phe Val Arg Leu Val Ser Arg Tyr Leu Ser Gly
        35                  40                  45
Glu Glu Glu Lys Ile Glu Trp Glu Lys Ile Lys Thr Pro Thr Asp Glu
    50                  55                  60
Ile Val Val Pro Tyr Asp Thr Leu Ala Ala Leu Gly Glu Asp Pro Ser
65                  70                  75                  80
Glu Thr Lys Glu Leu Leu Asp Lys Leu Val Val Leu Lys Leu Asn Gly
                85                  90                  95
Gly Leu Gly Thr Thr Met Gly Cys Thr Gly Pro Lys Ser Val Ile Glu
            100                 105                 110
Val Arg Asn Gly Leu Thr Phe Leu Asp Leu Ile Val Lys Gln Ile Glu
        115                 120                 125
Ser Leu Asn Asn Lys Tyr Asp Ser Lys Val Pro Leu Val Leu Met Asn
    130                 135                 140
Ser Phe Asn Thr His Asp Asp Thr Ile Lys Ile Val Glu Lys Tyr Ser
145                 150                 155                 160
Gly Ser Asn Ile Asp Ile His Ile Phe Asn Gln Ser Gln Tyr Pro Arg
                165                 170                 175
Met Val Ala Glu Asp Leu Thr Pro Trp Pro Thr Lys Gly Arg Thr Asp
            180                 185                 190
Lys Glu Ala Trp Tyr Pro Pro Gly His Gly Asp Val Phe Pro Ala Leu
        195                 200                 205
Leu Asn Ser Gly Lys Leu Asp Glu Leu Leu Ser Gln Gly Lys Glu Tyr
    210                 215                 220
Val Phe Ile Ala Asn Ser Asp Asn Leu Gly Ala Ile Val Asp Leu Lys
225                 230                 235                 240
Ile Leu Asn His Leu Val Lys Asn Lys Asn Glu Tyr Cys Met Glu Val
                245                 250                 255
Thr Pro Lys Thr Leu Ala Asp Val Lys Gly Gly Thr Leu Ile Ser Tyr
```

```
            260                 265                 270
Glu Gly Arg Val Gln Leu Leu Glu Ile Ala Gln Val Pro Glu Glu His
        275                 280                 285
Val Gly Glu Phe Lys Ser Ile Glu Lys Phe Lys Ile Phe Asn Thr Asn
    290                 295                 300
Asn Leu Trp Val Asn Leu Lys Ala Ile Lys Arg Leu Val Glu Ala Asp
305                 310                 315                 320
Ala Leu Lys Met Glu Ile Ile Pro Asn Pro Lys Glu Val Asp Gly Val
                325                 330                 335
Lys Val Leu Gln Leu Glu Thr Ala Ala Gly Ala Ala Ile Arg Phe Phe
            340                 345                 350
Asp Arg Ala Ile Gly Val Asn Val Pro Arg Ser Arg Phe Leu Pro Val
        355                 360                 365
Lys Ala Thr Ser Asp Leu Leu Leu Val Gln Ser Asp Leu Tyr Thr Val
    370                 375                 380
Glu Glu Gly Phe Val Ile Arg Asn Pro Ala Arg Val Asn Pro Thr Asn
385                 390                 395                 400
Pro Thr Ile Glu Leu Gly Pro Glu Phe Lys Lys Val Gly Asn Phe Leu
                405                 410                 415
Lys Arg Phe Lys Ser Ile Pro Ser Ile Ile Asp Leu Asp Ser Leu Lys
            420                 425                 430
Val Ser Gly Asp Val Trp Phe Gly Ser Gly Val Ile Leu Lys Gly Lys
        435                 440                 445
Val Ile Ile Glu Ala Lys Gln Gly Ala Thr Leu Glu Ile Pro Asp Glu
    450                 455                 460
Ser Val Ile Glu Asn Lys Val Val Ser Ser Pro Asp Asp Ile Val Asn
465                 470                 475                 480
```

<210> 105

<211> 573

<212> DNA

<213> Eucalyptus grandis

<400> 105

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ctcactcgat ctcgaaggcc agaaggggga ggccgagcct cttgcttttt ttcgtgtata      60
aaagggcctc cccattcct cattttcac catcctccgt tcgttcgttc ccttcccttt       120
ccattgttgc gtttaagccc tccaatttc ttttggcgtc ccgtttttgg ggctcccttg      180
aagatctcct cttcatttcg ggatttcctg ccttcgccgc gccatttgaa gttcttttc     240
tgagagaaga atttagacat ggctgatcgc atgctgactc gaagccacag ccttcgcgag     300
cgtttggacg agaccctctc tgctcaccgc aacgatattg tggccttcct ttcaagggtt     360
gaagccaagg gcaaaggcat cttgcagcgc caccagattt ttgctgagtt tgaggccatc     420
tctgaggaga gcagagcaaa gcttcttgat ggggcctttg gtgaagtcct caaatccact     480
caggaagcga ttgtgtcgcc tccatgggtt gctcttgctg ttcgtccaag gccgggcgtg     540
tgggagcaca tccgtgtgaa cgtccatgcg ctt                                  573
```

<210> 106
<211> 105
<212> PRT
<213> Eucalyptus grandis

<400> 106

```
Met Ala Asp Arg Met Leu Thr Arg Ser His Ser Leu Arg Glu Arg Leu
```

```
 1               5                   10                  15
Asp Glu Thr Leu Ser Ala His Arg Asn Asp Ile Val Ala Phe Leu Ser
            20                  25                  30
Arg Val Glu Ala Lys Gly Lys Gly Ile Leu Gln Arg His Gln Ile Phe
        35                  40                  45
Ala Glu Phe Glu Ala Ile Ser Glu Glu Ser Arg Ala Lys Leu Leu Asp
    50                  55                  60
Gly Ala Phe Gly Glu Val Leu Lys Ser Thr Gln Glu Ala Ile Val Ser
65                  70                  75                  80
Pro Pro Trp Val Ala Leu Ala Val Arg Pro Arg Pro Gly Val Trp Glu
                85                  90                  95
His Ile Arg Val Asn Val His Ala Leu
            100                 105

      <210> 107
      <211> 664
      <212> DNA
      <213> Eucalyptus grandis

      <400> 107
ggcacgagct cttctcgtct cgctttctca tataaagaag tgaaagaata cgaggatact      60
ccacttgggt atcgccaaga actcattggg tcgcgagaag attggccaac atgatggaat     120
ccggggttcc cctgtgcaac acttgcggag aggctgttgg ggttgatgag aaaggcgagg     180
tcttcgtggc ttgtcaagag tgcaacttcg ccatttgcaa ggcttgtgtc gaatatgaga     240
ttaaggaagg aagaaaagcg tgcttgcgct gtggcactcc atttgaagcg aactcgatgg     300
ctgatgctga gagaaatgaa ttgggaagtc gatcgacaat ggcagctcaa ctcaatgatc     360
ctcaggacac agggattcat gctagacaca tcagcagtgt ttctacgttg gatagtgaat     420
acaatgatga gactgggaac cctatctgga agaatagagt ggagagctgg aaggacaaaa     480
agaataagaa gaagaaggcc ccgacgaagg ctgagaaaga ggctcaagtt ccaccagagc     540
agcagatgga agagaagcaa attgctgatg cttcagagcc actctcgacc gttattccca     600
ttgccaaaag caaactcgca ccataccgaa ccgtaataat aatgcgattg atcattttgg     660
cact                                                                  664

      <210> 108
      <211> 184
      <212> PRT
      <213> Eucalyptus grandis

      <400> 108
Met Met Glu Ser Gly Val Pro Leu Cys Asn Thr Cys Gly Glu Ala Val
 1               5                  10                  15
Gly Val Asp Glu Lys Gly Glu Val Phe Val Ala Cys Gln Glu Cys Asn
            20                  25                  30
Phe Ala Ile Cys Lys Ala Cys Val Glu Tyr Glu Ile Lys Glu Gly Arg
        35                  40                  45
Lys Ala Cys Leu Arg Cys Gly Thr Pro Phe Glu Ala Asn Ser Met Ala
    50                  55                  60
Asp Ala Glu Arg Asn Glu Leu Gly Ser Arg Ser Thr Met Ala Ala Gln
65                  70                  75                  80
Leu Asn Asp Pro Gln Asp Thr Gly Ile His Ala Arg His Ile Ser Ser
                85                  90                  95
Val Ser Thr Leu Asp Ser Glu Tyr Asn Asp Glu Thr Gly Asn Pro Ile
            100                 105                 110
Trp Lys Asn Arg Val Glu Ser Trp Lys Asp Lys Lys Asn Lys Lys Lys
        115                 120                 125
Lys Ala Pro Thr Lys Ala Glu Lys Glu Ala Gln Val Pro Pro Glu Gln
    130                 135                 140
```

Gln Met Glu Glu Lys Gln Ile Ala Asp Ala Ser Glu Pro Leu Ser Thr
145 150 155 160
Val Ile Pro Ile Ala Lys Ser Lys Leu Ala Pro Tyr Arg Thr Val Ile
165 170 175
Ile Met Arg Leu Ile Ile Leu Ala
180

<210> 109
<211> 1293
<212> DNA
<213> Pinus radiata

<400> 109
ctgactctct ctctctctgt tttgtctcct ccctcctctc tctcgttttc gcttcgtcgt 60
gaacgcaccc acacgatctt ccattccctc aacaatgtcg actctcaccg tcccgcagcc 120
actgcccccct gtagccgatg actgcgagca gctccggaca gccttcgcag gatggggaac 180
aaatgagaag ctgatcatat ccatattggg tcataggaat gcggcgcaga ggaagctgat 240
tcggcaaacc tatgccgaga cttacggcga ggacctcctc aaggcattgg acagagaact 300
taccaatgat ttcgagaggc tggtggtcct ttggtcactt gatccggctg aacgtgatgc 360
gtacttggcg aatgaagcga cgaaaagatg gacttcaagc aaccaggttc tcatggaaat 420
agcctgcacg aggtctccgc agcagttgct tatggcaaga caagcatatc atgcccgata 480
caagaagtca atggaagagg acgtcgctca ccacacaact ggagattttc gtaagttgct 540
ggtacctctt gggagctcct accgtaatga tggagatgag gtgaatatga ctttggcaaa 600
agcagaggct aagatactcc acgagaagat ctcagagaag gcttatggcc atgaggatct 660
cataaggatt ttggctacta ggagcaaagc acaggtcaat gctacgctga atcactacaa 720
aaatgagttt ggaaatgata tcaacaagga tttgaaaact gatccaaaag acgcgttcct 780
tactatactg agagctacag taaagtgcct gactcgccct gagaagtatt ttgaaaaggt 840
tcttcgtcta gccatcaata agcgaggaac agatgaaggg gctctgacca gagtagttgc 900
taccagggcc gaggttgaca tgaagtttat aagtgaggag taccagagga ggaatagcat 960
ccctctcgat cgtgccattg tcaaggacac tactggagac tatgaaaaaa tgcttctggc 1020
attgattggc cacgtcgagg cttgatttac aagtactcat gaagctatcc tggtggaggc 1080
aatatctctg tttttggtgt ggtttgaggc atttctattt tccttgcttt ccaacaacgt 1140
gtagttacca acatgcctcc ccagttgtca gttgtagcta tgcgaagcaa atacacttct 1200
tataatggcg ttggtttatg tacttatgag aagtctttga ttttgatctt taatcaagac 1260
tgctagtaag tgatcgtgaa aaaaaaaaaa aaa 1293

<210> 110
<211> 484
<212> DNA
<213> Pinus radiata

<400> 110
ggaagctgat tcggcaaacc tatgccgaga cttacggcga ggacctcctc aaggcattgg 60
acagagaact taccaatgat tttgaggtct gatcttcttt aattatttgt attcatccca 120
tggagacgcg tccctctttc tctcagatta atccatattc attccgtatc gtcagaggct 180
ggtggtcctt tggtcgcttg atccggctga acgtgatgcg tacttggcga atgaagcgac 240
gaaaagatgg acttcaagca accaggttct catggaaata gcctgcacga ggtctccaca 300
gcagttgctc atggcaagac aagcatatca tgctcgatac aagaagtcgc tggaagagga 360
cgtcgctcac cacacaactg gagattttcg taagttgctg gtacctcttg tgagctccta 420
ccattatgat ggagatgagg tgaatatgac tttggcaaaa gcagaggcta agatactcca 480
cgag 484

<210> 111
<211> 221
<212> DNA
<213> Pinus radiata

<400> 111
cgtacttggc gaatgaagcg acgaaaagat ggacttcaag caaccaggtt ctaatggaaa 60
tagcctgcac gaggtctccg cagcagttgc ttatggcaag acaagcatat catgccccgat 120
acaagaagtc gctggaagag gacgtcggtc accacacaac tggagatttt cgtaagttgc 180
tggtacctct tgtgagctcc taccgttatg atggagatga g 221

<210> 112
<211> 789
<212> DNA
<213> Pinus radiata

<400> 112
atcgtcttcg gctcctcgcg atatcaccaa cttgcttccg cacagagaga gagagagaga 60
gagagagaga gaatggcgac tatcgcggtg ccaccgtcgg ttccgtctcc ggctgaggat 120
gccgagcagc tccaaaaagc tttcgcagga tgggggacga atgaagatct gatcatatcc 180
atactgcctc acagaaacgc agcgcagcgg aaagtaatcc gacaaacata tgccgagaca 240
tatggggaag atcttctcaa agcgcttgac aaggaactct ctagtgactt tgagagatct 300
gtgcttctgt ggaccctgga tcctgcggag cgtgatgcat tcttgtccaa tgaagctacc 360
aagagattga cttcgagcaa ctgggttctc atggaaattg cttgcacgag gtcttcaatg 420
gagttattca tggtgaggca ggcctatcat gctcgttata agaaatctct tgaagaagac 480
atcgcatatc acactactgg ggatttccgc aagctgcttg ttcctctggc aagtaccttt 540
cggtatgagg ggcctgaggt gaacatgaca ttggcgagat cagaggctaa gatacttcat 600
gagaagattc acgagaaggc ttacaatcat gatgagctca tcagaattgt tactacaaga 660
agtaaagctc agcttaatgc aaccctcaat tactacaaca atgagtttgg gaatgccatc 720
aacaaggatc tgaaggctga tccaaatgat gaatttctga aactgctgag atcagcaatt 780
aagtgcttg 789

<210> 113
<211> 704
<212> DNA
<213> Pinus radiata

<400> 113
gttttgttga gctactagat tttagtaaat caagaattca tcagctataa attgaggcat 60
tcgatttcag ttttagttac attttggtga agttggtcga cctgcattgc tgaagatatc 120
gtgcgaagta tgtgatttgt cgagaagatg tcaacaatta tagtgccagt tccaataccg 180
accccatctg aagactctga acgcctgagg aaggcttttg aagggtgggg cacaaatgag 240
aagtcaatca tacaaatatt aggacataga actgcagcac aacgcaaagt aatccgtcaa 300
agttattttc aactgtacga agaggatctc ttgaagcgat tagaatctga gctttcaagt 360
gactttgaga aagctgtatt cctttgggta ctagatccag ctgaacgtga tgcggtcata 420
tctcatggtg caataaagaa gtggaatgca aagaatatat cgcttttaga aatttccagt 480
gctcgatctt cggctgaact attgatggtg aggcaagcat atcatattcg gtacaaaaag 540
tccctcgaag aagacgtggc tgcacataca agtggaaact tccgtaagtt gctggtagca 600
cttgtaagtt catatcggta tgaaggtccg gaagtggata tgcatttggc aagttatgaa 660
gcaaagaagc taagtgaatc tataaccgag caaaaaagat aatt 704

<210> 114
<211> 316
<212> PRT
<213> Pinus radiata

<400> 114
Met Ser Thr Leu Thr Val Pro Gln Pro Leu Pro Pro Val Ala Asp Asp
1 5 10 15
Cys Glu Gln Leu Arg Thr Ala Phe Ala Gly Trp Gly Thr Asn Glu Lys
20 25 30
Leu Ile Ile Ser Ile Leu Gly His Arg Asn Ala Ala Gln Arg Lys Leu

```
        35                          40                          45
Ile Arg Gln Thr Tyr Ala Glu Thr Tyr Gly Glu Asp Leu Leu Lys Ala
    50                          55                          60
Leu Asp Arg Glu Leu Thr Asn Asp Phe Glu Arg Leu Val Val Leu Trp
65                      70                          75                      80
Ser Leu Asp Pro Ala Glu Arg Asp Ala Tyr Leu Ala Asn Glu Ala Thr
                85                          90                          95
Lys Arg Trp Thr Ser Ser Asn Gln Val Leu Met Glu Ile Ala Cys Thr
            100                         105                         110
Arg Ser Pro Gln Gln Leu Leu Met Ala Arg Gln Ala Tyr His Ala Arg
        115                         120                         125
Tyr Lys Lys Ser Met Glu Glu Asp Val Ala His His Thr Thr Gly Asp
    130                         135                         140
Phe Arg Lys Leu Leu Val Pro Leu Gly Ser Ser Tyr Arg Asn Asp Gly
145                     150                         155                     160
Asp Glu Val Asn Met Thr Leu Ala Lys Ala Glu Ala Lys Ile Leu His
                165                         170                         175
Glu Lys Ile Ser Glu Lys Ala Tyr Gly His Glu Asp Leu Ile Arg Ile
            180                         185                         190
Leu Ala Thr Arg Ser Lys Ala Gln Val Asn Ala Thr Leu Asn His Tyr
        195                         200                         205
Lys Asn Glu Phe Gly Asn Asp Ile Asn Lys Asp Leu Lys Thr Asp Pro
    210                         215                         220
Lys Asp Ala Phe Leu Thr Ile Leu Arg Ala Thr Val Lys Cys Leu Thr
225                     230                         235                     240
Arg Pro Glu Lys Tyr Phe Glu Lys Val Leu Arg Leu Ala Ile Asn Lys
                245                         250                         255
Arg Gly Thr Asp Glu Gly Ala Leu Thr Arg Val Val Ala Thr Arg Ala
            260                         265                         270
Glu Val Asp Met Lys Phe Ile Ser Glu Glu Tyr Gln Arg Arg Asn Ser
        275                         280                         285
Ile Pro Leu Asp Arg Ala Ile Val Lys Asp Thr Thr Gly Asp Tyr Glu
    290                         295                         300
Lys Met Leu Leu Ala Leu Ile Gly His Val Glu Ala
305                     310                         315

      <210> 115
      <211> 111
      <212> PRT
      <213> Pinus radiata

      <400> 115
Ser Ile Phe Ile Pro Tyr Arg Gln Arg Leu Val Val Leu Trp Ser Leu
 1              5                           10                          15
Asp Pro Ala Glu Arg Asp Ala Tyr Leu Ala Asn Glu Ala Thr Lys Arg
            20                          25                          30
Trp Thr Ser Ser Asn Gln Val Leu Met Glu Ile Ala Cys Thr Arg Ser
        35                          40                          45
Pro Gln Gln Leu Leu Met Ala Arg Gln Ala Tyr His Ala Arg Tyr Lys
    50                          55                          60
Lys Ser Leu Glu Glu Asp Val Ala His His Thr Thr Gly Asp Phe Arg
65                      70                          75                      80
Lys Leu Leu Val Pro Leu Val Ser Ser Tyr His Tyr Asp Gly Asp Glu
                85                          90                          95
Val Asn Met Thr Leu Ala Lys Ala Glu Ala Lys Ile Leu His Glu
            100                         105                         110
```

<210> 116
<211> 73
<212> PRT
<213> Pinus radiata

<400> 116
Tyr Leu Ala Asn Glu Ala Thr Lys Arg Trp Thr Ser Ser Asn Gln Val
1 5 10 15
Leu Met Glu Ile Ala Cys Thr Arg Ser Pro Gln Gln Leu Leu Met Ala
20 25 30
Arg Gln Ala Tyr His Ala Arg Tyr Lys Lys Ser Leu Glu Glu Asp Val
35 40 45
Gly His His Thr Thr Gly Asp Phe Arg Lys Leu Leu Val Pro Leu Val
50 55 60
Ser Ser Tyr Arg Tyr Asp Gly Asp Glu
65 70

<210> 117
<211> 239
<212> PRT
<213> Pinus radiata

<400> 117
Met Ala Thr Ile Ala Val Pro Pro Ser Val Pro Ser Pro Ala Glu Asp
1 5 10 15
Ala Glu Gln Leu Gln Lys Ala Phe Ala Gly Trp Gly Thr Asn Glu Asp
20 25 30
Leu Ile Ile Ser Ile Leu Pro His Arg Asn Ala Ala Gln Arg Lys Val
35 40 45
Ile Arg Gln Thr Tyr Ala Glu Thr Tyr Gly Glu Asp Leu Leu Lys Ala
50 55 60
Leu Asp Lys Glu Leu Ser Ser Asp Phe Glu Arg Ser Val Leu Leu Trp
65 70 75 80
Thr Leu Asp Pro Ala Glu Arg Asp Ala Phe Leu Ser Asn Glu Ala Thr
85 90 95
Lys Arg Leu Thr Ser Ser Asn Trp Val Leu Met Glu Ile Ala Cys Thr
100 105 110
Arg Ser Ser Met Glu Leu Phe Met Val Arg Gln Ala Tyr His Ala Arg
115 120 125
Tyr Lys Lys Ser Leu Glu Glu Asp Ile Ala Tyr His Thr Thr Gly Asp
130 135 140
Phe Arg Lys Leu Leu Val Pro Leu Ala Ser Thr Phe Arg Tyr Glu Gly
145 150 155 160
Pro Glu Val Asn Met Thr Leu Ala Arg Ser Glu Ala Lys Ile Leu His
165 170 175
Glu Lys Ile His Glu Lys Ala Tyr Asn His Asp Glu Leu Ile Arg Ile
180 185 190
Val Thr Thr Arg Ser Lys Ala Gln Leu Asn Ala Thr Leu Asn Tyr Tyr
195 200 205
Asn Asn Glu Phe Gly Asn Ala Ile Asn Lys Asp Leu Lys Ala Asp Pro
210 215 220
Asn Asp Glu Phe Leu Lys Leu Leu Arg Ser Ala Ile Lys Cys Leu
225 230 235

<210> 118
<211> 184
<212> PRT

<213> Pinus radiata

<400> 118

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Met Ser Thr Ile Ile Val Pro Val Pro Ile Pro Thr Pro Ser Glu Asp
1               5                   10                  15
Ser Glu Arg Leu Arg Lys Ala Phe Glu Gly Trp Gly Thr Asn Glu Lys
            20                  25                  30
Ser Ile Ile Gln Ile Leu Gly His Arg Thr Ala Ala Gln Arg Lys Val
        35                  40                  45
Ile Arg Gln Ser Tyr Phe Gln Leu Tyr Glu Glu Asp Leu Leu Lys Arg
    50                  55                  60
Leu Glu Ser Glu Leu Ser Ser Asp Phe Glu Lys Ala Val Phe Leu Trp
65                  70                  75                  80
Val Leu Asp Pro Ala Glu Arg Asp Ala Val Ile Ser His Gly Ala Ile
                85                  90                  95
Lys Lys Trp Asn Ala Lys Asn Ile Ser Leu Leu Glu Ile Ser Ser Ala
            100                 105                 110
Arg Ser Ser Ala Glu Leu Leu Met Val Arg Gln Ala Tyr His Ile Arg
        115                 120                 125
Tyr Lys Lys Ser Leu Glu Glu Asp Val Ala Ala His Thr Ser Gly Asn
    130                 135                 140
Phe Arg Lys Leu Leu Val Ala Leu Val Ser Ser Tyr Arg Tyr Glu Gly
145                 150                 155                 160
Pro Glu Val Asp Met His Leu Ala Ser Tyr Glu Ala Lys Lys Leu Ser
                165                 170                 175
Glu Ser Ile Thr Glu Gln Lys Arg
            180
```

<210> 119

<211> 568

<212> DNA

<213> Eucalyptus grandis

<400> 119

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tcgtcaccca attcctcacc aacaacaacc gagcctctgg cacactttcc tccatcagga     60
ggttctacgt ccaggacggc aaagtaattc caaactctat ggtaaacctc tccggtcttc    120
ccaaagtcaa ctcgatcacg tcagattact gcaccgctaa aatggacgtt ctcgacgatt    180
ctaccgcttt caacgtacat ggtggtcttg caaagatggg taaatccctt gcacgaggag    240
cagtactcgt ggtcagtctc tgggatgatc ttggcggcgg gatgacttgg ttggatggtc    300
tagcagggga tgcatctgcc cctgggaccc tccgtggacc gtgcaccgct gcgaatgtaa    360
catcagatcc ggctacctcc gtcactttct cgaatatccg agttggcgat atcaatagca    420
ctttctctca ggtgcacttt gggcaatgtg gaggtcaatt ttacgagggg ccagctcttt    480
gcgcagaccc attcgagtgt gtcttcagta atccgtatta cagccagtgt ctataagata    540
ttgaatataa cacggtttat gtccttcc                                      568
```

<210> 120
<211> 360
<212> DNA
<213> Eucalyptus grandis

<400> 120

cgacatgttc gacaaggccg ctctcttcgc tttctcttta ctcgccgtca cttacggtca 60
gcaggtcggt acccagactg ctgaatctca tccgcctctt acctggcaaa aatgtacgac 120
tgctggtgga tgtaccaatg tttctggtgg tagtgttgtc attgacgcga attggcgttg 180
ggtccattcc atcaacggta ctactaactg ttacactggt caagcatgga acacgacact 240
ctgtccggat gacacgactt gcgcagccaa ctgcgctttg gatggtgctg attactctgg 300
cacttatggc attactactt ccggcaatgc tcttaccctc aagttcgtca ctcaatcttc 360

<210> 121
<211> 375
<212> DNA
<213> Eucalyptus grandis

<400> 121
tattatgatg cgaatttaat tgctatagca gttgggttta gcaggacaat ttacagtgtg 60
attcctcaat ggagccgttt gataggtggg gtcttcttca gtttttgggt cttggctcat 120
ctgtatcctt ttgcaaaggg gctcatggga agacgtgggc gcacccctac cattgttttc 180
gtttggtcag gactcattgc aatcaccata tcacttcttt gggtggcaat cagcccccca 240
gctgggtcaa cccaaatcgg tggctctttc cagttcccct gataggttat tctttttaat 300
atgctttatc tgtttagtga cattactcca ttctttttta aatgagatga tcatgttgac 360
aaaaaaaaaa aaaaa 375

<210> 122
<211> 590
<212> DNA
<213> Eucalyptus grandis

<400> 122
cacgactttg gaagatggtg gtgttccgcc agatgctagt cctgcatcgc tactaaaaga 60
agccatccaa gtcatcagtt gcggatatga agacaagaca gaatggggaa aagaagttgg 120
ctggatatac ggttcggtga ctgaggatat attgactggg ttcaaaatgc actgccacgg 180
ctggagatcg gtgtactgta tacctaagag gcctgcattc aagggttcag caccgatcaa 240
cctttcggat cgtctacacc aggttctccg gtgggctctt gggtcagttg agattttctt 300
gagcaggcat tgcccaatct ggtatggcta cgggggaggt ttgaagtggt tggaacgatt 360
ttcttacatc aattcggttg tgtatccttg gacctccatc cccttgattg tttactgctc 420
actcccggct atctgccttc tcactggcca attcatcgtg cctgagatta gcaactatgc 480
aagtctcgtc tttatggcac ttttcatctc cattgctgcg actggtattc ttgagatgca 540
atggggtggt gttggaatcg atgactggtg gagaaacgag cagttttggg 590

<210> 123
<211> 590
<212> DNA
<213> Eucalyptus grandis

<400> 123
cactgcactg attcctaaga agttcggaaa ctcatacatg ttcattgatt ccataccttt 60
agctgagttc caaggccgac cccttgccga ccatccatcc gtgaaaaatg gacggcctcc 120
tggtgctctc actgttcttc gacggcttct tgatgcgtca acagttgcag aggcaataag 180
tgccatctca tgctggtacg aagataaaac tgagtggggg gaacgagtag ggtggattta 240
cgggtccgtc acagaggatg tcgtgacagg gtatagaatg cacaatcgag gatggacatc 300
tgtatactgc gtgaccaaga gagatgcttt tcgtgggacc gcacccatca atctcaccga 360
tcggcttcat caagtcctgc gctgggcgac gggctcggtg gagatattct tctctcgcaa 420
caatgccata atggccagcg gcaggctgaa gttccttcag aggattgctt acctcaacgt 480
tggaatttac cctttcactt ccatctttct tattgtctac tgctttctcc cggcgctctc 540
tctattctct gggaagttca ttgtgcaatc gctcagtgta tccttcctaa 590

<210> 124
<211> 619

<212> DNA
<213> Eucalyptus grandis

<400> 124
ggaaagggtg gtgacaagaa ttacatcgac aagaagagag ctggcaaaag aactgaatcc 60
aacattccaa tattcaacat ggaggatatt gaggagggga tggaaggtta tgatgatgag 120
agatcactgc ttatgtccca gaaaagctta gagaagcgct ttggtcaatc gccagtcttc 180
attgcagcaa cattcatgga acagggaggg cttccaccat ctactaatcc agcaactctt 240
ttgaaggaag caattcatgt tatcagctgt ggctatgagg acaagactga gtggggcaaa 300
gagattggat ggatatacgg ttctgtcaca gaagatatct taacagggtt taagatgcat 360
gctcgaggtt ggatctccat ttactgtatg cctccacgcc cagcattcaa gggttccgct 420
cccataaatc tttcagatcg tctgaaccaa gttcttcgat gggcattggg gtccattgag 480
attttactaa gcaggcattg tcctatatgg tatggttaca atgggagact gaagtggttg 540
gagagattgg catatataaa taccattgtg tatcccctca cttcaatcct cttgattgct 600
tattgcattc tgcctgcat 619

<210> 125
<211> 429
<212> DNA
<213> Eucalyptus grandis

<400> 125
cgtcctctta gcccсttgcc cagcagttgc aagtccatca ttcatcatca tgctcctcca 60
gactggcgtc ttcctcgcca cgctcctggg caccgcccat gcccaggccg taggcaagga 120
gcagaccgag actcacccca agatgacatg gaagaagtgc agtagcggtg gcagctgcac 180
tagcgtgaac ggtgaagtca ccatcgacgc caattggcgc tggctgcacg ggacgtcaga 240
caccaagaac tgctacgatg gcaacaagtg gaccgacaag tgcagcagcg cgactgactg 300
cgcctccaag tgcgccatcg aaggtgccac ctattccaag acatacggtg cctccactag 360
cggtgatgcc ctgactctca agttcgtcac caagcacgaa tatggtacca atatcggctc 420
tcgtctcta 429

<210> 126
<211> 534
<212> DNA
<213> Eucalyptus grandis

<400> 126
ctggaatcat cctttatttc tgtgactgtg cactttcaga gaggaaggag agagaggaaa 60
cccaaaagaa aaggttgtgg cttgcagctg aatcaatacc acacacccat atatacaata 120
ctcccacact attccctttt tttcttcctt cattaatttt atctctcttc attttgtaat 180
ttagatattt ccaaacaaaa gtctgtctct ttttttcttt tattattatc atttgttccg 240
actccgattt gccgtttgag agaagttacc tctgttatgg actgtggatc tccgagaacc 300
aagctgtcct gagttgaccc tgttgcttct ttaaccccac tcaaccgatc tgtcaagatt 360
gtagcctctg tgttccgaca aatgaatacc ggtggtcggt taatcgccgg ttcacacaac 420
aggaacgagt ttgttcttat taatgccgat gagaatgcca gaataagatc agtgcaagag 480
ctgagtgggc agacgtgtca aatctgtaga gacgagattg aattgaccgt cgat 534

<210> 127
<211> 450
<212> DNA
<213> Eucalyptus grandis

<400> 127
aaagcactga gtgagagctg gaactgaagt gactgactga tgttagagag agagagaatt 60
gagatagaga tggagtgacg aggaagcctc ccctcccttc ttcaccaaac gttcgctctc 120
tcccgctcca cacctccttc gctgctgccc cctccattgc gtagcaccgt cgccgccgct 180
cgccgccgat ctcctcttct ccgagacccg gaatcgcgaa ccgcttgtcg agcaccgcga 240

```
tcgcccccga gcgagcgaga gcgagagcga gagcgagagg ggaggacatg gaagcgaatg     300
ccgggatggt ggccggatcc tacaagcgga acgagctggt ccggatacgc cacgactccg     360
acagcgcgcc caagcccctg aagcacttgg atggccagat gtgtcagatt tgtggtgata     420
ccgttggact ttcggccagt ggtgatgtgt                                       450

      <210> 128
      <211> 302
      <212> DNA
      <213> Eucalyptus grandis

      <400> 128
tcttgtccag gtttactcaa ggttttaggt ggagtcaaca caaacttcac cgtcacctca      60
aaagcagcgg atgatggagc attctcagaa ctctatatct ttaaatggac atcgctgttg     120
atcccgccca tgactctcct gatcatgaac attgtatgga ggctgttggc gggatctccg     180
atgccatcaa taatgggtat gattcgtggg gtcccctctt tggtaggcta tttttcgcct     240
tctgggtcgc gtccatctct acccattcct aagggattgc tcgggaagca agaccggatg     300
cc                                                                     302

      <210> 129
      <211> 177
      <212> PRT
      <213> Eucalyptus grandis

      <400> 129
Val Thr Gln Phe Leu Thr Asn Asn Asn Arg Ala Ser Gly Thr Leu Ser
 1               5                  10                  15
Ser Ile Arg Arg Phe Tyr Val Gln Asp Gly Lys Val Ile Pro Asn Ser
            20                  25                  30
Met Val Asn Leu Ser Gly Leu Pro Lys Val Asn Ser Ile Thr Ser Asp
        35                  40                  45
Tyr Cys Thr Ala Lys Met Asp Val Leu Asp Asp Ser Thr Ala Phe Asn
    50                  55                  60
Val His Gly Gly Leu Ala Lys Met Gly Lys Ser Leu Ala Arg Gly Ala
65                  70                  75                  80
Val Leu Val Val Ser Leu Trp Asp Asp Leu Gly Gly Gly Met Thr Trp
                85                  90                  95
Leu Asp Gly Leu Ala Gly Asp Ala Ser Ala Pro Gly Thr Leu Arg Gly
            100                 105                 110
Pro Cys Thr Ala Ala Asn Val Thr Ser Asp Pro Ala Thr Ser Val Thr
        115                 120                 125
Phe Ser Asn Ile Arg Val Gly Asp Ile Asn Ser Thr Phe Ser Gln Val
    130                 135                 140
His Phe Gly Gln Cys Gly Gly Gln Phe Tyr Glu Gly Pro Ala Leu Cys
145                 150                 155                 160
Ala Asp Pro Phe Glu Cys Val Phe Ser Asn Pro Tyr Tyr Ser Gln Cys
                165                 170                 175
Leu


      <210> 130
      <211> 118
      <212> PRT
      <213> Eucalyptus grandis

      <400> 130
Met Phe Asp Lys Ala Ala Leu Phe Ala Phe Ser Leu Leu Ala Val Thr
 1               5                  10                  15
```

Tyr Gly Gln Gln Val Gly Thr Gln Thr Ala Glu Ser His Pro Pro Leu
20 25 30
Thr Trp Gln Lys Cys Thr Thr Ala Gly Gly Cys Thr Asn Val Ser Gly
35 40 45
Gly Ser Val Val Ile Asp Ala Asn Trp Arg Trp Val His Ser Ile Asn
50 55 60
Gly Thr Thr Asn Cys Tyr Thr Gly Gln Ala Trp Asn Thr Thr Leu Cys
65 70 75 80
Pro Asp Asp Thr Thr Cys Ala Ala Asn Cys Ala Leu Asp Gly Ala Asp
85 90 95
Tyr Ser Gly Thr Tyr Gly Ile Thr Thr Ser Gly Asn Ala Leu Thr Leu
100 105 110
Lys Phe Val Thr Gln Ser
115

<210> 131
<211> 93
<212> PRT
<213> Eucalyptus grandis

<400> 131
Tyr Tyr Asp Ala Asn Leu Ile Ala Ile Ala Val Gly Phe Ser Arg Thr
1 5 10 15
Ile Tyr Ser Val Ile Pro Gln Trp Ser Arg Leu Ile Gly Gly Val Phe
20 25 30
Phe Ser Phe Trp Val Leu Ala His Leu Tyr Pro Phe Ala Lys Gly Leu
35 40 45
Met Gly Arg Arg Gly Arg Thr Pro Thr Ile Val Phe Val Trp Ser Gly
50 55 60
Leu Ile Ala Ile Thr Ile Ser Leu Leu Trp Val Ala Ile Ser Pro Pro
65 70 75 80
Ala Gly Ser Thr Gln Ile Gly Gly Ser Phe Gln Phe Pro
85 90

<210> 132
<211> 196
<212> PRT
<213> Eucalyptus grandis

<400> 132
Thr Thr Leu Glu Asp Gly Gly Val Pro Pro Asp Ala Ser Pro Ala Ser
1 5 10 15
Leu Leu Lys Glu Ala Ile Gln Val Ile Ser Cys Gly Tyr Glu Asp Lys
20 25 30
Thr Glu Trp Gly Lys Glu Val Gly Trp Ile Tyr Gly Ser Val Thr Glu
35 40 45
Asp Ile Leu Thr Gly Phe Lys Met His Cys His Gly Trp Arg Ser Val
50 55 60
Tyr Cys Ile Pro Lys Arg Pro Ala Phe Lys Gly Ser Ala Pro Ile Asn
65 70 75 80
Leu Ser Asp Arg Leu His Gln Val Leu Arg Trp Ala Leu Gly Ser Val
85 90 95
Glu Ile Phe Leu Ser Arg His Cys Pro Ile Trp Tyr Gly Tyr Gly Gly
100 105 110
Gly Leu Lys Trp Leu Glu Arg Phe Ser Tyr Ile Asn Ser Val Val Tyr
115 120 125
Pro Trp Thr Ser Ile Pro Leu Ile Val Tyr Cys Ser Leu Pro Ala Ile

130 135 140
Cys Leu Leu Thr Gly Gln Phe Ile Val Pro Glu Ile Ser Asn Tyr Ala
145 150 155 160
Ser Leu Val Phe Met Ala Leu Phe Ile Ser Ile Ala Ala Thr Gly Ile
165 170 175
Leu Glu Met Gln Trp Gly Gly Val Gly Ile Asp Asp Trp Trp Arg Asn
180 185 190
Glu Gln Phe Trp
195

<210> 133
<211> 196
<212> PRT
<213> Eucalyptus grandis

<400> 133
Thr Ala Leu Ile Pro Lys Lys Phe Gly Asn Ser Tyr Met Phe Ile Asp
1 5 10 15
Ser Ile Pro Leu Ala Glu Phe Gln Gly Arg Pro Leu Ala Asp His Pro
20 25 30
Ser Val Lys Asn Gly Arg Pro Pro Gly Ala Leu Thr Val Leu Arg Arg
35 40 45
Leu Leu Asp Ala Ser Thr Val Ala Glu Ala Ile Ser Ala Ile Ser Cys
50 55 60
Trp Tyr Glu Asp Lys Thr Glu Trp Gly Glu Arg Val Gly Trp Ile Tyr
65 70 75 80
Gly Ser Val Thr Glu Asp Val Val Thr Gly Tyr Arg Met His Asn Arg
85 90 95
Gly Trp Thr Ser Val Tyr Cys Val Thr Lys Arg Asp Ala Phe Arg Gly
100 105 110
Thr Ala Pro Ile Asn Leu Thr Asp Arg Leu His Gln Val Leu Arg Trp
115 120 125
Ala Thr Gly Ser Val Glu Ile Phe Phe Ser Arg Asn Asn Ala Ile Met
130 135 140
Ala Ser Gly Arg Leu Lys Phe Leu Gln Arg Ile Ala Tyr Leu Asn Val
145 150 155 160
Gly Ile Tyr Pro Phe Thr Ser Ile Phe Leu Ile Val Tyr Cys Phe Leu
165 170 175
Pro Ala Leu Ser Leu Phe Ser Gly Lys Phe Ile Val Gln Ser Leu Ser
180 185 190
Val Ser Phe Leu
195

<210> 134
<211> 206
<212> PRT
<213> Eucalyptus grandis

<400> 134
Gly Lys Gly Gly Asp Lys Asn Tyr Ile Asp Lys Lys Arg Ala Gly Lys
1 5 10 15
Arg Thr Glu Ser Asn Ile Pro Ile Phe Asn Met Glu Asp Ile Glu Glu
20 25 30
Gly Met Glu Gly Tyr Asp Asp Glu Arg Ser Leu Leu Met Ser Gln Lys
35 40 45
Ser Leu Glu Lys Arg Phe Gly Gln Ser Pro Val Phe Ile Ala Ala Thr
50 55 60

Phe Met Glu Gln Gly Gly Leu Pro Pro Ser Thr Asn Pro Ala Thr Leu
65 70 75 80
Leu Lys Glu Ala Ile His Val Ile Ser Cys Gly Tyr Glu Asp Lys Thr
85 90 95
Glu Trp Gly Lys Glu Ile Gly Trp Ile Tyr Gly Ser Val Thr Glu Asp
100 105 110
Ile Leu Thr Gly Phe Lys Met His Ala Arg Gly Trp Ile Ser Ile Tyr
115 120 125
Cys Met Pro Pro Arg Pro Ala Phe Lys Gly Ser Ala Pro Ile Asn Leu
130 135 140
Ser Asp Arg Leu Asn Gln Val Leu Arg Trp Ala Leu Gly Ser Ile Glu
145 150 155 160
Ile Leu Leu Ser Arg His Cys Pro Ile Trp Tyr Gly Tyr Asn Gly Arg
165 170 175
Leu Lys Trp Leu Glu Arg Leu Ala Tyr Ile Asn Thr Ile Val Tyr Pro
180 185 190
Leu Thr Ser Ile Leu Leu Ile Ala Tyr Cys Ile Leu Pro Ala
195 200 205

<210> 135
<211> 126
<212> PRT
<213> Eucalyptus grandis

<400> 135
Met Leu Leu Gln Thr Gly Val Phe Leu Ala Thr Leu Leu Gly Thr Ala
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His Ala Gln Ala Val Gly Lys Glu Gln Thr Glu Thr His Pro Lys Met
20 25 30
Thr Trp Lys Lys Cys Ser Ser Gly Gly Ser Cys Thr Ser Val Asn Gly
35 40 45
Glu Val Thr Ile Asp Ala Asn Trp Arg Trp Leu His Gly Thr Ser Asp
50 55 60
Thr Lys Asn Cys Tyr Asp Gly Asn Lys Trp Thr Asp Lys Cys Ser Ser
65 70 75 80
Ala Thr Asp Cys Ala Ser Lys Cys Ala Ile Glu Gly Ala Thr Tyr Ser
85 90 95
Lys Thr Tyr Gly Ala Ser Thr Ser Gly Asp Ala Leu Thr Leu Lys Phe
100 105 110
Val Thr Lys His Glu Tyr Gly Thr Asn Ile Gly Ser Arg Leu
115 120 125

<210> 136
<211> 51
<212> PRT
<213> Eucalyptus grandis

<400> 136
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1 5 10 15
Phe Val Leu Ile Asn Ala Asp Glu Asn Ala Arg Ile Arg Ser Val Gln
20 25 30
Glu Leu Ser Gly Gln Thr Cys Gln Ile Cys Arg Asp Glu Ile Glu Leu
35 40 45
Thr Val Asp
50

<210> 137
<211> 54
<212> PRT
<213> Eucalyptus grandis

<400> 137
Met Glu Ala Asn Ala Gly Met Val Ala Gly Ser Tyr Lys Arg Asn Glu
1   5   10   15
Leu Val Arg Ile Arg His Asp Ser Asp Ser Ala Pro Lys Pro Leu Lys
            20   25   30
His Leu Asp Gly Gln Met Cys Gln Ile Cys Gly Asp Thr Val Gly Leu
        35   40   45
Ser Ala Ser Gly Asp Val
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<210> 138
<211> 100
<212> PRT
<213> Eucalyptus grandis

<400> 138
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Thr Val Thr Ser Lys Ala Ala Asp Asp Gly Ala Phe Ser Glu Leu Tyr
            20   25   30
Ile Phe Lys Trp Thr Ser Leu Leu Ile Pro Pro Met Thr Leu Leu Ile
        35   40   45
Met Asn Ile Val Trp Arg Leu Leu Ala Gly Ser Pro Met Pro Ser Ile
    50   55   60
Met Gly Met Ile Arg Gly Val Pro Ser Leu Val Gly Tyr Phe Ser Pro
65   70   75   80
Ser Gly Ser Arg Pro Ser Leu Pro Ile Pro Lys Gly Leu Leu Gly Lys
                85   90   95
Gln Asp Arg Met
            100

<210> 139

<211> 2906
<212> DNA
<213> Eucalyptus grandis

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tcgcatgctg actcgaagcc acagccttcg cgagcgtttg gacgagaccc tctctgctca 300
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tgcgcttgtt cttgagcaat tggaggttgc tgagtatctg cacttcaaag aagagcttgc 600
tgatggaagc ttgaatggta actttgtgct tgagcttgac tttgagccat tcactgcctc 660
ttttccgcgc ccgactcttt ccaagtctat tggcaatggc gtcgagtttc tcaatcgcca 720

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cctccaacat gtcctgagga aggcggagga gtatctgacc tcgctcaaac ccgagacccc    900
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tccccacgga tactttgctc aggacgacgt ccttggttat ccggataccg gtggccaggt   1140
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acaaggactg gatattactc ctcggattct cattatcact cggcttcttc cagacgcggt   1260
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tcgcgtcccc ttcagaaatg agaagggagt cgtccgcaag tggatttccc ggttcgaggt   1380
gtggccctat ttggaaagat acactgagga tgtcgcgagc gaacttgctg gagagttgca   1440
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cccagagtca gacatatact ggaagaaatt tgaggaaaag taccacttct cttgccagtt   1620
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tggactctac cgagttgtcc acgggatcga cgtcttcgac ccgaagttca acattgtttc   1800
accaggtgct gacatgagca tctactttgc ttacaccgaa caggagcggc ggttgaaatc   1860
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tgtgttgaaa gataagaaga agcctattat tttcaccatg gcaaggctgg accgtgtcaa   1980
gaacttgaca gggcttgttg agtggtatgg caagaactcc aagttgaggg aactcgccaa   2040
cttggtcgtg gttggaggtg acaggaggaa ggattcgaag gacttggaag agcagtctga   2100
gatgaagaaa atgtacgacc tcatcgaaaa gtacaagctg aatggccagt tcaggtggat   2160
ttcctcccag atgaaccggg tgaggaatgg agagctctac cgctacatct gtgacacgaa   2220
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gacttgtgga ttgccaacct ttgccacttg caatggtgga ccagctgaga tcattgtgca   2340
tggcaaatcg ggctaccaca ttgatcctta ccatggtgac caggcggccg agcttcttgt   2400
agacttcttc aacaagtgca agattgacca gtcccactgg gacgagatct caaagggtgc   2460
catgcagaga attgaagaga agtatacatg gaaaatatat tctgagaggc tgttgaacct   2520
gactgccgtg tatggcttct ggaagcatgt gactaacctt gatcggcgcg agagtcgccg   2580
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tccgtatttc gtactaaaaa aaaaaa                                        2906
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<210> 140
<211> 1592
<212> DNA
<213> Pinus radiata

<400> 140

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gcttcaaaga ggaagggaga ttcttctcca gggttttaac tgggagtcac ataaatacaa    180
gtggtggcca aatttggaag aaaagatccc gcacattgct aaagcaggat ttacatctgt    240
atggctgcca cctgcttttg attctgctgc accccaaggt tacttgcccc gaaacattta    300
ttctctgaac tctgcatatg gttcagaata tcagctgaaa agcttactta tgacaatgcg    360
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gcttcggaaa agtgttggtt ttcaagattt tcgatttgac tttgccaagg gttatgcagc    660
aaaatttgtg aaagaatata ttgaggcatc gaccccccatg tttgctgttg ggaatattg    720
ggattcgtgc aattatactc ctcctagcta tcatcttgat aagaaccaag atagccatag    780
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gggaaagcct cctggagtgc ttggctggtg gcctccaagg ctggtacttt taaatgaaaa 960
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tattggaagg aaagtttgca tgaagattgg agatggctca tggtgtccga atggcaggga 1260
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gggtacgata tacagattat ataaaatttt ctacacggct atagacctac tctagaggtc 1500
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tcattatgtg tgtacataaa aaaaaaaaaa aa 1592

<210> 141
<211> 3747
<212> DNA
<213> Eucalyptus grandis

<400> 141
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cgtgtacggt gggaggtcta tataagcaga gctggtttag tgaaccgtca gatccgctag 180
ccgcaattac tgtgagttag ctcactcatt aggcacccca ggctttacac tttatacttc 240
cggctcggta tattgtgtgg aattgtgagc ggataacaat ttcacacagg aaacagctat 300
gaccttgatt acgccaagct cgaaattaac cctcactaaa gggaacaaaa gctggagctc 360
gcgcgcctgc aggtcgacac tagtggatcc aaagaattcg ggcacgagct cttctcgtct 420
cgctttctca tataaagaag tgaaagaata cgaggatact ccacttgggt atcgccaaga 480
actcattggg tcgcgagaag attggccaac atgatggaat ccggggttcc cctgtgcaac 540
acttgcggag aggctgttgg ggttgatgag aaaggcgagg tcttcgtggc ttgtcaagag 600
tgcaacttcg ccatttgcaa ggcttgtgtc gaatatgaga ttaaggaagg aagaaaagcg 660
tgcttgcgct gtggcactcc atttgaagcg aactcgatgg ctgatgctga gagaaatgaa 720
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<210> 142
<211> 770
<212> DNA
<213> Eucalyptus grandis

<400> 142
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aactttcgat actatcctgg tgatgatgtc ttgtgaaact aatgggctat tgtttaagta 720
accggcagtt ttctgtcaac atctcttttg atttaaaaaa aaaaaaaaaa 770

<210> 143
<211> 543
<212> DNA
<213> Pinus radiata

<400> 143
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ggaaagacga gagtcattcc gctatcttga gatgttttac atcttgaagt acagaaatct 180

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aaa                                                                   543
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<210> 144

<211> 805

<212> PRT

<213> Eucalyptus grandis

<400> 144

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Asp Glu Thr Leu Ser Ala His Arg Asn Asp Ile Val Ala Phe Leu Ser
            20                  25                  30
Arg Val Glu Ala Lys Gly Lys Gly Ile Leu Gln Arg His Gln Ile Phe
        35                  40                  45
Ala Glu Phe Glu Ala Ile Ser Glu Glu Ser Arg Ala Lys Leu Leu Asp
    50                  55                  60
Gly Ala Phe Gly Glu Val Leu Lys Ser Thr Gln Glu Ala Ile Val Ser
65                  70                  75                  80
Pro Pro Trp Val Ala Leu Ala Val Arg Pro Arg Pro Gly Val Trp Glu
                85                  90                  95
His Ile Arg Val Asn Val His Ala Leu Val Leu Glu Gln Leu Glu Val
            100                 105                 110
Ala Glu Tyr Leu His Phe Lys Glu Glu Leu Ala Asp Gly Ser Leu Asn
        115                 120                 125
Gly Asn Phe Val Leu Glu Leu Asp Phe Glu Pro Phe Thr Ala Ser Phe
    130                 135                 140
Pro Arg Pro Thr Leu Ser Lys Ser Ile Gly Asn Gly Val Glu Phe Leu
145                 150                 155                 160
Asn Arg His Leu Ser Ala Lys Leu Phe His Asp Lys Glu Ser Leu His
                165                 170                 175
Pro Leu Leu Glu Phe Leu Gln Val His Cys Tyr Lys Gly Lys Asn Met
            180                 185                 190
Met Val Asn Ala Arg Ile Gln Asn Val Phe Ser Leu Gln His Val Leu
        195                 200                 205
Arg Lys Ala Glu Glu Tyr Leu Thr Ser Leu Lys Pro Glu Thr Pro Tyr
    210                 215                 220
Ser Gln Phe Glu His Lys Phe Gln Glu Ile Gly Leu Glu Arg Gly Trp
225                 230                 235                 240
Gly Asp Thr Ala Glu Arg Val Leu Glu Met Ile Gln Leu Leu Leu Asp
                245                 250                 255
Leu Leu Glu Ala Pro Asp Pro Cys Thr Leu Glu Lys Phe Leu Asp Arg
            260                 265                 270
Val Pro Met Val Phe Asn Val Val Ile Met Ser Pro His Gly Tyr Phe
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        275                 280                 285
Ala Gln Asp Asp Val Leu Gly Tyr Pro Asp Thr Gly Gly Gln Val Val
    290                 295                 300
Tyr Ile Leu Asp Gln Val Arg Ala Leu Glu Glu Glu Met Leu His Arg
305                 310                 315                 320
Ile Lys Gln Gln Gly Leu Asp Ile Thr Pro Arg Ile Leu Ile Ile Thr
                325                 330                 335
Arg Leu Leu Pro Asp Ala Val Gly Thr Thr Cys Gly Gln Arg Leu Glu
            340                 345                 350
Lys Val Phe Gly Thr Glu Tyr Ser His Ile Leu Arg Val Pro Phe Arg
        355                 360                 365
Asn Glu Lys Gly Val Val Arg Lys Trp Ile Ser Arg Phe Glu Val Trp
    370                 375                 380
Pro Tyr Leu Glu Arg Tyr Thr Glu Asp Val Ala Ser Glu Leu Ala Gly
385                 390                 395                 400
Glu Leu Gln Gly Lys Pro Asp Leu Ile Ile Gly Asn Tyr Ser Asp Gly
                405                 410                 415
Asn Ile Val Ala Ser Leu Leu Ala His Lys Leu Gly Val Thr Gln Cys
            420                 425                 430
Thr Ile Ala His Ala Leu Glu Lys Thr Lys Tyr Pro Glu Ser Asp Ile
        435                 440                 445
Tyr Trp Lys Lys Phe Glu Glu Lys Tyr His Phe Ser Cys Gln Phe Thr
    450                 455                 460
Ala Asp Leu Ile Ala Met Asn His Thr Asp Phe Ile Ile Thr Ser Thr
465                 470                 475                 480
Phe Gln Glu Ile Ala Gly Ser Lys Asp Thr Val Gly Gln Tyr Glu Ser
                485                 490                 495
His Met Asn Phe Thr Leu Pro Gly Leu Tyr Arg Val Val His Gly Ile
            500                 505                 510
Asp Val Phe Asp Pro Lys Phe Asn Ile Val Ser Pro Gly Ala Asp Met
        515                 520                 525
Ser Ile Tyr Phe Ala Tyr Thr Glu Gln Glu Arg Arg Leu Lys Ser Phe
    530                 535                 540
His Pro Glu Ile Glu Glu Leu Leu Phe Ser Asp Val Glu Asn Lys Glu
545                 550                 555                 560
His Leu Cys Val Leu Lys Asp Lys Lys Lys Pro Ile Ile Phe Thr Met
                565                 570                 575
Ala Arg Leu Asp Arg Val Lys Asn Leu Thr Gly Leu Val Glu Trp Tyr
            580                 585                 590
Gly Lys Asn Ser Lys Leu Arg Glu Leu Ala Asn Leu Val Val Val Gly
        595                 600                 605
Gly Asp Arg Arg Lys Asp Ser Lys Asp Leu Glu Glu Gln Ser Glu Met
    610                 615                 620
Lys Lys Met Tyr Asp Leu Ile Glu Lys Tyr Lys Leu Asn Gly Gln Phe
625                 630                 635                 640
Arg Trp Ile Ser Ser Gln Met Asn Arg Val Arg Asn Gly Glu Leu Tyr
                645                 650                 655
Arg Tyr Ile Cys Asp Thr Lys Gly Val Phe Val Gln Pro Ala Ile Tyr
            660                 665                 670
Glu Ala Phe Gly Leu Thr Val Val Glu Ala Met Thr Cys Gly Leu Pro
        675                 680                 685
Thr Phe Ala Thr Cys Asn Gly Gly Pro Ala Glu Ile Ile Val His Gly
    690                 695                 700
Lys Ser Gly Tyr His Ile Asp Pro Tyr His Gly Asp Gln Ala Ala Glu
705                 710                 715                 720
Leu Leu Val Asp Phe Phe Asn Lys Cys Lys Ile Asp Gln Ser His Trp
                725                 730                 735
```

Asp Glu Ile Ser Lys Gly Ala Met Gln Arg Ile Glu Glu Lys Tyr Thr
740 745 750
Trp Lys Ile Tyr Ser Glu Arg Leu Leu Asn Leu Thr Ala Val Tyr Gly
755 760 765
Phe Trp Lys His Val Thr Asn Leu Asp Arg Arg Glu Ser Arg Arg Tyr
770 775 780
Leu Glu Met Phe Tyr Ala Leu Lys Tyr Arg Pro Leu Ala Gln Ser Val
785 790 795 800
Pro Pro Ala Val Glu
805

<210> 145
<211> 419
<212> PRT
<213> Pinus radiata

<400> 145
Met Gly Tyr Pro Val Gln Glu Val Ser Lys Glu His Asp Gln Trp Ala
1 5 10 15
Gly Phe Val Glu Gly Glu Ser Val Leu Gln Arg Gly Arg Glu Ile Leu
20 25 30
Leu Gln Gly Phe Asn Trp Glu Ser His Lys Tyr Lys Trp Trp Pro Asn
35 40 45
Leu Glu Glu Lys Ile Pro His Ile Ala Lys Ala Gly Phe Thr Ser Val
50 55 60
Trp Leu Pro Pro Ala Phe Asp Ser Ala Ala Pro Gln Gly Tyr Leu Pro
65 70 75 80
Arg Asn Ile Tyr Ser Leu Asn Ser Ala Tyr Gly Ser Glu Tyr Gln Leu
85 90 95
Lys Ser Leu Leu Met Thr Met Arg Lys Lys Asn Val Arg Ala Met Ala
100 105 110
Asp Ile Val Ile Asn His Arg Met Gly Ser Ser Gln Gly Phe Gly Gly
115 120 125
Leu Tyr Asn Arg Tyr Asp Gly Leu Pro Leu Pro Trp Asp Glu Arg Ala
130 135 140
Val Thr Arg Cys Ser Gly Gly Leu Gly Asn Trp Ser Thr Gly Asp Asn
145 150 155 160
Phe His Gly Val Pro Asn Val Asp His Thr Gln Asp Phe Val Arg Lys
165 170 175
Asp Ile Lys Asp Trp Leu Arg Trp Leu Arg Lys Ser Val Gly Phe Gln
180 185 190
Asp Phe Arg Phe Asp Phe Ala Lys Gly Tyr Ala Ala Lys Phe Val Lys
195 200 205
Glu Tyr Ile Glu Ala Ser Thr Pro Met Phe Ala Val Gly Glu Tyr Trp
210 215 220
Asp Ser Cys Asn Tyr Thr Pro Pro Ser Tyr His Leu Asp Lys Asn Gln
225 230 235 240
Asp Ser His Arg Gln Arg Ile Ile Asn Trp Ile Asp Gly Thr Ser Gly
245 250 255
Ile Ser Ala Ala Phe Asp Phe Thr Thr Lys Gly Ile Leu Gln Glu Ala
260 265 270
Val Lys Gly Gln Cys Trp Arg Leu Arg Asp His Gln Gly Lys Pro Pro
275 280 285
Gly Val Leu Gly Trp Trp Pro Pro Arg Leu Val Leu Leu Asn Glu Asn
290 295 300
His Asp Thr Gly Ser Thr Gln Gly His Trp Pro Phe Pro Cys Asp His
305 310 315 320

```
Ile Met Glu Gly Tyr Ala Tyr Ile Leu Thr His Pro Gly Ile Pro Ala
                325                 330                 335
Val Phe Tyr Asp His Phe Phe Asp Trp Gly Ser Ser Ile Gln Asn Glu
            340                 345                 350
Ile Ile Lys Leu Met Arg Ile Arg Arg Thr Gln Asp Leu Asn Ser Arg
        355                 360                 365
Ser Ser Ile Glu Ile Leu Glu Ala Ser Ser Thr Val Tyr Ala Ala Ile
    370                 375                 380
Ile Gly Arg Lys Val Cys Met Lys Ile Gly Asp Gly Ser Trp Cys Pro
385                 390                 395                 400
Asn Gly Arg Glu Trp Gln Leu Ala Thr Cys Gly His Arg Tyr Ala Val
                405                 410                 415
Trp His Lys


      <210> 146
      <211> 955
      <212> PRT
      <213> Eucalyptus grandis

      <400> 146
Met Met Glu Ser Gly Val Pro Leu Cys Asn Thr Cys Gly Glu Ala Val
 1               5                  10                  15
Gly Val Asp Glu Lys Gly Glu Val Phe Val Ala Cys Gln Glu Cys Asn
            20                  25                  30
Phe Ala Ile Cys Lys Ala Cys Val Glu Tyr Glu Ile Lys Glu Gly Arg
        35                  40                  45
Lys Ala Cys Leu Arg Cys Gly Thr Pro Phe Glu Ala Asn Ser Met Ala
    50                  55                  60
Asp Ala Glu Arg Asn Glu Leu Gly Ser Arg Ser Thr Met Ala Ala Gln
65                  70                  75                  80
Leu Asn Asp Pro Gln Asp Thr Gly Ile His Ala Arg His Ile Ser Ser
                85                  90                  95
Val Ser Thr Leu Asp Ser Glu Tyr Asn Asp Glu Thr Gly Asn Pro Ile
            100                 105                 110
Trp Lys Asn Arg Val Glu Ser Trp Lys Asp Lys Lys Asn Lys Lys Lys
        115                 120                 125
Lys Ala Pro Thr Lys Ala Glu Lys Glu Ala Gln Val Pro Pro Glu Gln
    130                 135                 140
Gln Met Glu Glu Lys Gln Ile Ala Asp Ala Ser Glu Pro Leu Ser Thr
145                 150                 155                 160
Val Ile Pro Ile Ala Lys Ser Lys Leu Ala Pro Tyr Arg Thr Val Ile
                165                 170                 175
Ile Met Arg Leu Ile Ile Leu Ala Leu Phe Phe His Tyr Arg Val Thr
            180                 185                 190
His Pro Val Asp Ser Ala Tyr Pro Leu Trp Leu Thr Ser Ile Ile Cys
        195                 200                 205
Glu Ile Trp Phe Ala Tyr Ser Trp Val Leu Asp Gln Phe Pro Lys Trp
    210                 215                 220
Ser Pro Val Asn Arg Ile Thr His Val Asp Arg Leu Ser Ala Arg Tyr
225                 230                 235                 240
Glu Lys Glu Gly Glu Pro Ser Glu Leu Ala Ala Val Asp Phe Phe Val
                245                 250                 255
Ser Thr Val Asp Pro Met Lys Glu Pro Pro Leu Ile Thr Ala Asn Thr
            260                 265                 270
Val Leu Ser Ile Leu Ala Val Asp Tyr Pro Val Asp Lys Val Ser Cys
        275                 280                 285
```

```
Tyr Leu Ser Asp Asp Gly Ala Ala Met Leu Ser Phe Glu Ser Leu Val
    290                 295                 300
Glu Thr Ala Asp Phe Ala Arg Lys Trp Val Pro Phe Cys Lys Lys Tyr
305                 310                 315                 320
Ser Ile Glu Pro Arg Ala Pro Glu Phe Tyr Phe Ser Gln Lys Ile Asp
                325                 330                 335
Tyr Leu Lys Asp Lys Ile Gln Pro Ser Phe Val Lys Glu Arg Arg Ala
            340                 345                 350
Met Lys Arg Asp Tyr Glu Glu Phe Lys Val Arg Val Asn Ala Leu Val
        355                 360                 365
Ala Lys Ala Gln Lys Ala Pro Glu Glu Gly Trp Ser Met Gln Asp Gly
    370                 375                 380
Thr Pro Trp Pro Gly Asn Asn Ser Arg Asp His Pro Gly Met Ile Gln
385                 390                 395                 400
Val Phe Leu Gly Ser Ser Gly Ala His Asp Ile Glu Gly Asn Glu Leu
                405                 410                 415
Pro Arg Leu Val Tyr Val Ser Arg Glu Lys Arg Pro Gly Phe Gln His
            420                 425                 430
His Lys Lys Ala Gly Ala Glu Asn Ala Leu Val Arg Val Ser Ala Ile
        435                 440                 445
Leu Thr Asn Ala Pro Tyr Ile Leu Asn Leu Asp Cys Asp His Tyr Val
    450                 455                 460
Asn Tyr Ser Asn Ala Val Arg Glu Ala Met Cys Phe Leu Met Asp Pro
465                 470                 475                 480
Gln Val Gly Arg Asn Leu Cys Tyr Val Gln Phe Pro Gln Arg Phe Asp
                485                 490                 495
Gly Ile Asp Arg Ser Asp Arg Tyr Ala Asn Arg Asn Thr Val Phe Phe
            500                 505                 510
Asp Val Asn Met Lys Gly Leu Asp Gly Ile Gln Gly Pro Val Tyr Val
        515                 520                 525
Gly Thr Gly Cys Val Phe Asn Arg Gln Ala Leu Tyr Gly Tyr Gly Pro
    530                 535                 540
Pro Ser Met Pro Asn Leu Pro Lys Pro Ser Ser Ser Cys Ser Trp Cys
545                 550                 555                 560
Gly Cys Cys Ser Cys Cys Cys Pro Ser Lys Lys Pro Thr Lys Asp Leu
                565                 570                 575
Ser Glu Val Tyr Arg Asp Ser Lys Arg Glu Asp Leu Asn Ala Ala Ile
            580                 585                 590
Phe Asn Leu Gly Glu Ile Asp Asn Tyr Asp Glu His Glu Arg Ser Met
        595                 600                 605
Leu Ile Ser Gln Met Ser Phe Glu Lys Thr Phe Gly Leu Ser Thr Val
    610                 615                 620
Phe Ile Glu Ser Thr Leu Leu Ala Asn Gly Gly Val Pro Glu Ser Ala
625                 630                 635                 640
His Pro Ser Met Leu Ile Lys Glu Ala Ile His Val Ile Ser Cys Gly
                645                 650                 655
Tyr Glu Glu Lys Thr Ala Trp Gly Lys Glu Ile Gly Trp Ile Tyr Gly
            660                 665                 670
Ser Val Thr Glu Asp Ile Leu Thr Gly Phe Lys Met His Cys Arg Gly
        675                 680                 685
Trp Arg Ser Val Tyr Cys Met Pro Leu Arg Pro Ala Phe Lys Gly Ser
    690                 695                 700
Ala Pro Ile Asn Leu Ser Asp Arg Leu His Gln Val Leu Arg Trp Ala
705                 710                 715                 720
Leu Gly Ser Val Glu Ile Phe Leu Ser Arg His Cys Pro Leu Trp Tyr
                725                 730                 735
Gly Phe Gly Gly Gly Arg Leu Lys Trp Leu Gln Arg Leu Ala Tyr Ile
```

```
                740                     745                     750
Asn Thr Ile Val Tyr Pro Phe Thr Ser Leu Pro Leu Val Ala Tyr Cys
            755                     760                     765
Thr Ile Pro Ala Ile Cys Leu Leu Thr Gly Lys Phe Ile Ile Pro Thr
        770                     775                     780
Leu Ser Asn Leu Ala Ser Val Leu Phe Leu Gly Leu Phe Leu Ser Ile
785                     790                     795                     800
Ile Val Thr Ser Val Leu Glu Leu Arg Trp Ser Gly Val Ser Ile Glu
                805                     810                     815
Asp Trp Trp Arg Asn Glu Gln Phe Trp Val Ile Gly Gly Val Ser Ala
            820                     825                     830
His Leu Phe Ala Val Phe Gln Gly Phe Leu Lys Met Leu Ala Gly Leu
        835                     840                     845
Asp Thr Asn Phe Thr Val Thr Thr Lys Ala Ala Asp Asp Ala Glu Phe
    850                     855                     860
Gly Glu Leu Tyr Met Ile Lys Trp Thr Thr Leu Leu Ile Pro Pro Thr
865                     870                     875                     880
Thr Leu Leu Ile Val Asn Met Val Gly Val Val Ala Gly Phe Ser Asp
                885                     890                     895
Ala Leu Asn Lys Gly Tyr Glu Ala Trp Gly Pro Leu Phe Gly Lys Val
            900                     905                     910
Phe Phe Ala Phe Trp Val Ile Leu His Leu Tyr Pro Phe Leu Lys Gly
        915                     920                     925
Leu Met Gly Arg Gln Asn Arg Thr Pro Thr Ile Val Val Leu Trp Ser
    930                     935                     940
Val Phe Trp Leu Leu Ser Ser Leu Ser Ser Gly
945                     950                     955
```

```
<210> 147
<211> 124
<212> PRT
<213> Eucalyptus grandis

<400> 147
Leu Lys Asp Ala Ile Ile Ser His Gly Cys Phe Leu Arg Glu Cys Arg
 1               5                  10                  15
Val Glu Arg Ser Ile Val Gly Glu Arg Ser Arg Leu Asp Ser Gly Val
            20                  25                  30
Glu Leu Lys Asp Thr Val Met Met Gly Ala Asp Tyr Tyr Gln Thr Glu
        35                  40                  45
Ser Glu Ile Ala Ser Leu Leu Ala Glu Gly Lys Val Pro Ile Gly Ile
    50                  55                  60
Gly Lys Asn Thr Lys Ile Arg Asn Cys Ile Ile Asp Lys Asn Ala Lys
65                  70                  75                  80
Ile Gly Lys Asp Val Ala Ile Val Asn Lys Asp Gly Val Glu Glu Ala
                85                  90                  95
Asp Arg Pro Gly Asp Gly Phe Tyr Ile Arg Leu Gly Ile Thr Val Ile
            100                 105                 110
Leu Glu Lys Ala Thr Ile Glu Asp Gly Thr Val Ile
        115                 120
```

```
<210> 148
<211> 80
<212> PRT
<213> Pinus radiata

<400> 148
```

```
Asp Thr Ile Ser Asn Gly Gly Leu Gln Arg Ile Tyr Glu Arg Tyr Thr
 1               5                  10                  15
Trp Lys Ile Tyr Ala Glu Lys Leu Met Thr Leu Ala Gly Val Tyr Gly
            20                  25                  30
Phe Trp Lys Tyr Val Ser Lys Leu Glu Arg Arg Glu Ser Phe Arg Tyr
        35                  40                  45
Leu Glu Met Phe Tyr Ile Leu Lys Tyr Arg Asn Leu Val Lys Thr Val
    50                  55                  60
Pro Phe Ser Val Glu Glu Ser Thr Asp Gly Ile Glu Glu Lys Ser Ala
65                  70                  75                  80
```

<210> 149

<211> 375

<212> DNA

<213> Eucalyptus grandis

<400> 149

```
atccgctggg aggtttagga ctgacatcag cgatctcatg acccaaattg ttgagttcct      60

agccaagaac agcgcacctc tcaccgtcaa catttatcca ttcctgagtc tctatggtaa     120
cgacaacttc cccatcgact atgccttctt cgatggggcc accccagtcg tggacaacgg     180
gatacaatac acgaacgtgt tcgatgccaa cttcgacact ctagtatcgg ctcttaaggc     240
ggtgggccat ggggacatga ccctcatggt gggtgaagtg ggatggccta cagatggtga     300
caagaatgcc aatatagcta gtgctgttag attctacaac ggtcttatgc cgaggctcgc     360
ggccaatact gggac                                                      375
```

<210> 150
<211> 356
<212> DNA
<213> Eucalyptus grandis

<400> 150

```
gaacaacaac tctccattgc tagccaacat ctacacctac ttcagctacg ttggtaaccc      60
gaaagacatc agcctgccct acgccctatt cacctcgccg tcggtcgtcg tccgagacgg     120
agcccatgag taccggaatc tgttcgacgc gatgctggac gccctctact ccgcactcga     180
gagggctggc ggggctgccc tcagggtggt ggtctcggag agcggctggc catccgcggg     240
cgcgttcgct gcgacggtcg acaacgcgag gacatacaac gggaatctga tcaagcacgt     300
gaagggcggc acgcgaagag gccgaacggg gcgatcgaga cctacatatt cgcctt         356
```

<210> 151
<211> 470
<212> DNA
<213> Eucalyptus grandis

<400> 151

```
cttcctcagg gagaccggct cgcctttctt ggtgaacccg tacccatttt tcggcttctc      60
caaggacact ctcgattacg cgctgttcag gccgaatgca ggggtgatgg atgagaattc     120
caaacttgtt tacactaaca tgttggacgg gcaattggac gctgtctact cggcgatgaa     180
ggtgctgggc ttcaccgata tcgagatcgt gatagccgaa acaggatggc cctcattgtg     240
tgactcgacc caagtcggcg tggatgcaaa gacggcggca gaatacaaca gtaatctcat     300
ccgccatgta tcgtcgggcg ccggcacgcc cctcatgcca aaacggacat ttgagaccta     360
```

cattttgct ctcttcaacg agaatttgaa gccgggaccg acgtgcgaga ggaacttcgg 420
actcttcagg ccggacatga caccggtgta tgatgccggg atcttgaggc 470

<210> 152
<211> 412
<212> DNA
<213> Eucalyptus grandis

<400> 152
tgatttattg tgattgccat tcctcttctt tcctgattct gcatgttaca cggtgcagca 60
actctcttat tttaacatca ctgggcaggt gtgcccttat tccttaatac aaggcagcgt 120
gcacccatta gttgaaatta atagggtatt ttggctgtct attgggcgaa aagaggcccc 180
aatgtttctc gtactccggg ttcttctggt tctcgtcgaa catggcaaat atgtaagttt 240
cgatcggctt tccgggcttc ttgggagtcc cttgcttcac gtgctgaatc aaattcgagt 300
tgtaaattct cgcgttttca atggacgttc ccttcccgcc agcagatggg ccaaccactc 360
tccgacacaa ccacttctag ggaccccccg ccggatttct ctagtgcaga gt 412

<210> 153
<211> 328
<212> DNA
<213> Eucalyptus grandis

<400> 153
gaacaacaac tctccattgc tagccaacat ctacacctac ttcagctacg ttggtaaccc 60
gaaagacatc agcctgccct acgccctatt cacctcgccg tcggtcgtcg tccgagacgg 120
agcccatgag taccggaatc tgttcgacgc gatgctggac gccctctact ccgcactcga 180
gagggctggc ggggctgccc tcagggtggt ggtctcggag agcggctggc catccgcggg 240
cgcgttcgct gcgacggtcg acaacgcgag gacatacaac gggaatctga tcaagcacgt 300
gaagggcggc acgccgaaga ggccgaac 328

<210> 154
<211> 373
<212> DNA
<213> Eucalyptus grandis

<400> 154
gttaacgcct accccttctt cgcctacgag tccaactccg acgtcatctc cctggactac 60
gccctcttcc gggagaaccc gggcgtcgtc gacgccggca acgggctccg ctacttcaac 120
ctcttcgacg cccagatcga cgccgtcttc gccgccatgt cggccctcaa gtacgacgac 180
atcaagatgg tcgtcaccga gacgggctgg ccctccaagg gcgacgagaa cgaggtcggc 240
gccagcaagg acaatgccgc cgcctacaac ggcaacctcg tccgccggat cctcaccggc 300
ggcggcaccc ctctgaggcg gcaggccgac ctcaccgtct acctcttcgc gctcttcaac 360
gagaacaaga agc 373

<210> 155
<211> 465
<212> DNA
<213> Eucalyptus grandis

<400> 155
cgatcatcag tttcctggtg agcaacaact ctccattgct agccaacatc tacacctact 60
tcagctacgt cggtaacccg aaagacatca gcctgcccta cgccctattc acctcgccat 120
cggtcgtcgt ccgagacggg gcccatgagt accggaacct gttcgacgcg atgctggacg 180
ccctctactc cgcactcgag agggctggcg gggctgccct ccgggtggtg gtctcggaga 240
gcggctggcc atccgcgggc gcgttcgctg cgacggtcga caacgcgagg acatacaacg 300
ggaatctgat caagcacgtg aagggcggca cgccgaagag gccgaacggg gcgatcgaga 360
cctacatatt cgccttgttc gacgagaacc agaagcagcc ggagctggag aagcacttcg 420

ggctcttctt ccccaacaag cagcccaagt acccgctcag ctttg 465

<210> 156
<211> 359
<212> DNA
<213> Eucalyptus grandis

<400> 156
ccagatcaag gtctcaacag ctgtggacac gcgcatctta ggagaatcgt ctcctccatc 60
taagggcaca cttaaggccg atcacagacc tctcctagat cctataatca cattcctagt 120
caacaacaag tcccctctgc ttgtcaacat ctatccgtac ttcagctaca gcgacaatcc 180
caacgaacgc ctcgactatg ctctgttcac ggcgaactcg gttgtggtgt cggatggagc 240
acttgggtac cggaacttgt ttgacgcaat tctagatgct gtttactctg cactagagaa 300
atccggcggg gggtccctag aagtggttgt gtcggagagt ggttggccat ctgctggcg 359

<210> 157
<211> 325
<212> DNA
<213> Eucalyptus grandis

<400> 157
ccagatcaag gtctcaacag ctgtggacac gcgcatctta ggagaatcgt ctcctccatc 60
taagggcaca cttaaggccg atcacagacc tctcctagat cctataatca cattcctagt 120
caacaacaag tcccctctgc ttgtcaacat ctatccgtac ttcagctaca gcgacaatcc 180
caacgaacgc ctcgactatg ctctgttcac ggcgaactcg gttgtggtgt cggatggagc 240
acttgggtac cggaacttgt ttgacgcaat tctagatgct gtttactctg cactagagaa 300
atccggcggg gggtccctag aagtg 325

<210> 158
<211> 362
<212> DNA
<213> Eucalyptus grandis

<400> 158
gtttgctatg ggatgctcgg gaacaacctg ccgtccgcgt cggaagtcgt cgccctctac 60
aagtcccgcg gcatcacgca gatgagactc tacgacccta gccaaccagc tctacaagcc 120
ctgagaggct cgaacatcga gctcatcctc ggcgtcccca actcggagct ccaggccctt 180
gcttccaacc ccgccaacgc gaactcgtgg gtgcagagga acgtgaagaa ctactcgccc 240
ggcgtcaggt tccgctacat cgccgtgggc aacgaggtga gccctgtcaa cggaggcact 300
gcacaattcg ccaggttcgt cctccccgcg atgaggaaca tacaggccgc gctcagatcg 360
tc 362

<210> 159
<211> 432
<212> DNA
<213> Eucalyptus grandis

<400> 159
taaatgccga tgtatacgaa tcaccagaag acaacccact tccatccgcc ggaacgttcc 60
gaagcgacat aagtgatgtc atgacccaaa tcgtcaagtt catggctgag aacaatgcac 120
ccttcaccgt gaacatttac ccgtttctga gtctttacgg caataatgac ttccctttca 180
attatgcttt cttcgacggt gcaactccaa ttgttgacaa ggggattgag tacaccaatg 240
tctttgatgc caactttgac actttggtgt cggctcttaa agcagttgga catgggaaca 300
tgaccatcat catagcgcgag gtgggttggc ccacagaagg tgacataaat gcaaacaacg 360
gtaacgcgta caggttttat aatgggctct ttacaaaact tggagcgaat agagggactc 420
cacttcggcc ag 432

<210> 160
<211> 379
<212> DNA
<213> Eucalyptus grandis

<400> 160
caccgtacct gtgaacgcag acgtgtacaa ctccccgtc agcaatcccg taccatccgc 60
tgggaggttt aggactgaca tcagcgatct catgacccaa attgtcgagt tcctagccaa 120
gaacagcgca cctctcaccg tcaacattta tccattcctg agtctctatg gtaacgacaa 180
cttccccatc gactatgcct tcttcgatgg ggccacccca gtcgtggaca acgggataca 240
atacacgaac gtgttcgatg ccaacttcga cactctagta tcggctctta aggtggtggg 300
ccatggggac atgaccctca tggtgggtga agtgggatgg cctacagatg gtgacaagaa 360
tgccaatata gctagtgct 379

<210> 161
<211> 361
<212> DNA
<213> Eucalyptus grandis

<400> 161
gtttgctatg ggatgctcgg gaacaacctg ccgtccgcgt cggaagtcgt cgccctctac 60
aagtcccgcg gcatcacgca gatgagactc tacgacccta gccaaccagc tctacaagcc 120
ctgagaggct cgaacatcga gctcatcctc ggcgtcccca actcggagct ccaggccctt 180
gcttccaacc ccgccaacgc gaactcgtgg gtgcagagga acgtgaagaa ctactcgccc 240
ggcgtcaggt tccgctacat cgccgtgggc aacgaggtga gccctgtcaa cggaggcact 300
gcacaattcg ccaggttcgt cctccccgcg atgaggaaca tacaggccgc gctcagatcg 360
t 361

<210> 162
<211> 402
<212> DNA
<213> Pinus radiata

<400> 162
ggactacgct ctcttccggc ccagcaatgg cgtggtcgat tccaagacca atttgcacta 60
cgacaacctg ttctacgccc agatcgacgc tgcgtactcg gcgctcgccg ctctgggcta 120
cggtaaggtc gaggtcaggg tctcggagac agggtggccc tccaaggggg acgatgatga 180
gctcggtgcc acgcccgaga atgcaaagac ttacaatggg aacctttgg agaggctcca 240
caagaaggag ggtactcccc tgaagcccaa tgtgagcgtg caggccttca tttttgcgct 300
ctttaatgag aatttgaagt ccgggcctac atccgagaga aattatgggc tctttaaacc 360
agacggaacc gagacgtatg accttggctt gaaagggatt ga 402

<210> 163
<211> 297
<212> DNA
<213> Pinus radiata

<400> 163
ccctcgtcga tacccttctt tctgccatgg aggacttggg gtatcgcaac atcccactca 60
tcgttactga aagcggatgg ccttctggtg gcaatgatgt ggccacggtt gacaacgctc 120
gcgtttataa caacaatctc atccgccatg tgctctcaaa tgtagggact cccaagaggc 180
cgggaacgag cattgagacc tacatcttcg cacttttcaa cgagaacaga aaagctggtg 240
atgagacgga gcgtcacttt gggcttttct accctaacca acaatttgta tactctg 297

<210> 164
<211> 427
<212> DNA

<213> Pinus radiata

<400> 164
gcttcccacc gtctaaaggt gtcttcagga acgaggttaa agatatcatg agttctctac 60
ttcaattcct gtcagatcac gggtctccct tcatggctaa catctatcca tacttcagct 120
acaatgggaa caggggttcc atttctctgg actacgctct gtttaggtca acctctaccg 180
tggtgcagga cgagggtcgc agctacatca acttattcga tgccctcgtc gataccctc 240
tttctgccat ggaggacttg gggtatcgca acatcccact catcgttact gaaagcggat 300
ggccttctgg tggcaatgat gtggccacgg ttgacaacgc tcgcgtttat aacaacaatc 360
tcatccgcca tgtgctctca aatgtaggga ctcccaagag gccgggaacg agcattgaga 420
cctacat 427

<210> 165
<211> 205
<212> DNA
<213> Pinus radiata

<400> 165
ggttgacaac gctcgcgttt ataacaacaa tctcatccgc catgtgctct caaatgtagg 60
gactcccaag aggccgggaa cgagcattga gacctacatc ttcgcacttt tcaacgagaa 120
cagaaaagct ggtgatgaga cggagcgtca ctttgggctt ttctacccta accaacaatc 180
tgtatactct ctaaacttta ctccg 205

<210> 166
<211> 393
<212> DNA
<213> Pinus radiata

<400> 166
ggactacgct ctgtttaggt caacctctac cgtggtgcag gacgagggtc gcagctacat 60
caacttattc gatgccctcg tcgataccct tctttctgcc atggaggact tggggtatcg 120
caacatccca ctcatcgtta ctgaaagcgg atggccttct ggtggcaatg atgtggccac 180
ggttgacaac gctcgcgttt ataacaacaa tctcatccgc catgtgctct caaatgtagg 240
gactcccaag aggccgggaa cgagcattga gacctacatc ttcgcacttt tcaacgagaa 300
cagaaaagct ggtgatgaga cggagcgtca ctttgggctt ttctacctta accaacaatc 360
tgtatactct ctaaacttta ctccgtaact gcg 393

<210> 167
<211> 394
<212> DNA
<213> Pinus radiata

<400> 167
ggactacgct ctgtttaggt caacctctac cgtggtgcag gacgagggtc gcagctacat 60
caacttattc gatgccctcg tcgataccct tctttctgcc atggaggact tggggtatcg 120
caacatccca ctcatcgtta ctgaaagcgg atggccttct ggtggcaatg atgtggccac 180
ggttgacaac gctcgcgttt ataacaacaa tctcatccgc catgtgctct caaatgtagg 240
gactcccaag aggccgggaa cgagcattga gacctacatc ttcgcacttt tcaacgagaa 300
cagaaaagct ggtgatgaga cggagcgtca ctttgggctt ttctacctta accaacaatc 360
tgtatactct ctaaacttta ctccgtaact gcgt 394

<210> 168
<211> 498
<212> DNA
<213> Pinus radiata

<400> 168

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ggnnacgctc tgtttaggtc aacctctacc gnggtgcagg acgagggtcg cagctacatc      60
aacttattcg atgccctcgt cgataccctt ctttctgcca tggaggactt ggggtatcgc     120
aacatcccac tcatcgttac tgaaagcgga tggccttctg gtggcaatga tgtggccacg     180
gttgacaacg ctcgcgttta taacaacaat ctcatccgcc atgtgctctc aaatgtaggg     240
actcccaaga ggccgggaac gagcattgag acctacatct tcgcactttt caacgagaac     300
agaaaagctg gtgatgagac ggagcgtcac tttgggcttt tctaccttaa ccaacaatct     360
gtatactctc taaactttac tccgtaactg cgtcgcagtc cgacgaacga atagagccaa     420
tatgaatatg tcctctatat gtcaactgcc tcgatagata tattatgtaa catgctcgat     480
gcagctcata tgcttcta                                                   498
```

<210> 169
<211> 278
<212> DNA
<213> Pinus radiata

<400> 169

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ggactacgct ctgtttaggt caacctctac cgggtgcagg acgagggtcg cagctacatc      60
aacttattcg atgccctcgt cgataccctt ctttctgcca tggaggactt ggggtatcgc     120
aacatcccac tcatcgttac tgaaagcgga tggccttctg gtggcaatga tgtggccacg     180
gttgacaacg ctcgcgttta taacaacaat ctcatccgcc atgtgctctc aaatgtaggg     240
actcccaaga ggccgggaac gagcattgag acctcatc                             278
```

<210> 170
<211> 419
<212> DNA
<213> Pinus radiata

<400> 170

```
ggactacgct ctgtttaggt caacctctac cgaggtgcag gacgagggtc gcagctacat      60
caacttattc gatgccctcg tcgataccct tctttctgcc atggaggact tggggtatcg     120
caacatccca ctcatcgtta ctgaaagcgg atggccttct ggtggcaatg atgtggccac     180
ggttgacaac gctcgcgttt ataacaacaa tctcatccgc catgtgctct caaatgtagg     240
gactcccaag aggccgggaa cgagcattga gacctacatc ttcgcacttt tcaacgagaa     300
cagaaaagct ggtgatgaga cggagcgtca ctttgggctt ttctacctta accaacaatc     360
tgtatactct ctaaacttta ctccgtaact gcgtcgcagt ccgacgaacg aatagagcc      419
```

<210> 171
<211> 437
<212> DNA
<213> Pinus radiata

<400> 171

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gacgtacgga tcgtatcttg ttcccgccat gaggaacatt caaacagcga ttgaaaacgt      60
caatctgcag aataacatca aggtctcaac cactcactcc tcgggcgtta ctaatggctt     120
cccaccgtct aaaggtgtct tcaggaacga ggttaaagat atcatgagtt ctctacttca     180
attcctgtca gatcacgggt ctcccttcat ggctaacatc tatccatact tcagctacaa     240
tgggaacagg ggttccattt ctctggacta cgctctgttt aggtcaacct ctaccgtggt     300
gcaggacgag ggtcgcagct acatcaactt attcgatgcc ctcgtcgata cccttctttc     360
tgccatggag gacttggggt atcgcaacat cccactcatc gttactgaaa gcggatggcc     420
ttctggtggc aatgatg                                                    437
```

<210> 172
<211> 343
<212> DNA
<213> Pinus radiata

<400> 172

gacgtacgga tcgtatcttg ttcccgccat gaggaacatt caaacagcga ttgaaaacgt 60
caatctgcag aataacatca aggtctcaac cactcactcc tcgggcgtta ctaatggctt 120
cccaccgtct aaaggtgtct tcaggaacna ggttaaagat atcatgagtt ctctacttca 180
attcctgtca gatcacgggt ctcccttcat ggctaacatc tatccatact tcagctacaa 240
tgggaacagg ggttccattt ctctggacta cgctctgtta ggtcaacctc taccgtggtg 300
caggacgagg gtcgcagcta catcaactta ttcgatgccc tcg 343

<210> 173
<211> 563
<212> DNA
<213> Pinus radiata

<400> 173
ctggattatg ctctgtttaa gtctacgtct acggtggtgc aagacggtga tcacagctac 60
accaacctgt tcgatgccat ggttgacact cttttgtcgg ccatggaagc ctcggggtat 120
cccaacatcc cgatcgtcat tgccgaaagt ggatggcctt ctgctggcgc ggatctggcc 180
accattgaga atgctcagag ctataacaat aatcttatta aacatgtatt atcgaatgca 240
ggaacaccaa agaggccagg aatgagcatc gacacatatg ttttcgcgct tttcaacgag 300
gatttgaaag gcaacgagac agagaaacac tttggactat tcgaccctac tactaaacag 360
cctgtatact ctgtcaactt ctcaccatga gttgtgttgg aatccacatc acatgtgacc 420
cgagtcgatg cagacaagcc cttatcttca tgcactgcta tatgtaatct gcaagtgtat 480
ggttatttct aaaataaata aaatgtcaaa gaaagttgag tttatttcta aaataaataa 540
aatgcaggca gagttccctg agt 563

<210> 174
<211> 639
<212> DNA
<213> Pinus radiata

<400> 174
caacgaattg cagctcatct cctccagcca ggacgccgcg aatggttggg tcaatgacaa 60
cattcgcccc ttctatcccg ccaccaatat caagtatatt gcagtaggca acgaggtttt 120
gataaaaacg acgtacggat cgtatcttgt tcctgccatg aggaatattc aaaccgcgct 180
gcagaacgcc aatctgcaga ataacatcaa ggtctcgacc actcactcct ccgatgttag 240
cgagggctac ccgccgtcta acggtgtgtt caaagacgag gtcaaggaca ccatgaagtc 300
tgtgcttcaa ttcctgttag atcacgggtc tcccttcatg ggcaacatct atccatactt 360
cagctacatc aacaacaggg ctcagataac tctggactac gctctgttca aatccacgtc 420
tacagtggtg caagacaaag gtcggagttc aaatacttgt tcgatgcctt ggtcgatact 480
cttgtttcgg ccatggaagc cttgggatat cccaacatcc cactgatcgt taccgaaagc 540
ggatggcctt ctgctgaggc ggatgtggcc acagttgaca atgctcgtac ttataacaac 600
aatctcatcc gccatgtctt atcgaatgaa gggacacca 639

<210> 175
<211> 534
<212> DNA
<213> Pinus radiata

<400> 175
aaatggttgg gttaatgaca atattgtccc ctatctatca ccagtatcaa atatattgcg 60
gtgggcaacg aggttttgcc tagcacgcag tacgtatcgt atcttgttcc tgccatgaac 120
aacattcaaa ccgcgatcca gaacgccaat ctgcagaaca tcaaggtctc taccccccat 180
gccttcaatg ttataggcaa cagttacccg ccttcacagg gagcattcag tgacgatgtg 240
aaggatacca tgagctctat actcaaattt ctgtcagata acggggctcc gttcatggcc 300
aatgtgtatc catatttcag ctacgtcggc gacagcagca acattcatct ggactacgct 360
ctctttcagc ccacggctac ggcggtgaca gacggagatc acagctacag caatttgttt 420
gatgccatgg tggattctat tttctccgca atggaagcct tgggatattc caacatccca 480
cttattgtta ctgaaagcgg atggccatct gctggcgcgg atgcggccac aact 534

<210> 176
<211> 345
<212> DNA
<213> Pinus radiata

<400> 176
ggttaacgag cacattgtgc ccttctatcc cgccaccaat gtcaaataca ttgctgtggg 60
aaacgaggtt ttgataggcg atgccaacaa cgtaccctat cttgttccgg ccatgaacaa 120
cattcaaact gcgatccaga acgctaaact gcaggatagc atcaaggtct ctaccaccca 180
caggccggat gttagcagcg gctacccgcc gtctaaagga gtcttcgtag atgctgtgaa 240
ggacacgatg ggccaaatac tcaaatttct gtcacagaac ggcggtccct tcatggcgga 300
tgtctatcca tacttcagct acatcggcaa cccaagcaac attca 345

<210> 177
<211> 339
<212> DNA
<213> Pinus radiata

<400> 177
cccgatcgtc attaccgaaa gtggatggcc ttctgctggc gcggaagtgg ccaccattga 60
gaatgctcag acctataaca ataatcttat taaacatgta ttatcgaatg caggaacacc 120
aaagaggcca ggaatgagca tcgacacata tgttttcgcg cttttcaacg aggatttgaa 180
gcaaggcgac gagacataga aacactttgg actattcgac cctaatacta aacagcctgt 240
atactctgtc aacttctcac catgagttgt gttggaatcc acatcacatg tgacccgagt 300
cgatgcagac aagcccttat cttcatgcac tgctatatg 339

<210> 178
<211> 313
<212> DNA
<213> Pinus radiata

<400> 178
gtcataactg agagcgggtg gccttccgcg ggcaatgagg cggctactgt tgagaatgcg 60
cagacttaca acaacaatct gatcaaacat gtgctttcaa atgcaggaac gccaaagagg 120
cctggacagc acattgatac atacattttc gctcttttca acgagaattt gaaaggcggg 180
gacgagccag aacgacattt tggacttttc tatcctgatc aaaaccttgt ttaccctgtt 240
aacttctccc cttaaattca tctgatctgt gttttgcatt agaatttcca gtattaccca 300
ttttctcaca ata 313

<210> 179
<211> 460
<212> DNA
<213> Pinus radiata

<400> 179
cgacaacatt cgccaattct atccggccac caacatcaaa tacatcgctg ttggcaacga 60
agttttttca agtgaaaatc ggcagcatct tccatatctc gttcctgcca tgagaaacat 120
tcaaaccgca gtccagaacg ccaatctgca gagctccata aaggtctcca ctacccacgc 180
cacgtctgtt ctgggaaact cgtatccccc ttctcaggga gaattcgctg atgaattgaa 240
gagtagcatg agcgatgtac ttaactttct ggcagagaat gggtctcctt tcatggctaa 300
cgtgtatccc tacttcagtt acatttacaa ccaggcccaa atctcgttag actatgcttt 360
gtttaaatcc gcggatcccg tggtgagtga tgaaggtcgt ctctataaaa gcttgttcga 420
tgcgctggtg gattctctga tttccgctat ggagaaatcg 460

<210> 180
<211> 296

<212> DNA
<213> Pinus radiata

<400> 180
ttatggcggc gtctatccat acttcagcta catcggcaac acaaaagaca tttctctgga 60
ttatgctctg tttaagtcta cgtctacggt ggtgcaagac ggtgatcaca gctacaccaa 120
cctgttcgat gccatggttg atactctttt gtcggccatg gaagcctctg ggtatcccaa 180
catcccgatc gtcattaccg aaagtggatg gccttctgct ggcgcggaag tggccaccat 240
tgagaatgct cagacctata acaataatct tattaaacat gtattatcga atgcag 296

<210> 181
<211> 351
<212> DNA
<213> Pinus radiata

<400> 181
tacgtaccct atcttgttcc ggccatgaag aacattcaaa ctgcgatcca gaacgctaaa 60
ctgcaggata gcatcaaggt ctctaccacc cacaggccgg atgttagcag cggctacccg 120
ccgtctaaag gagtcttcgt agatgctgtg aaagacacga tgagccaaat actcaatttt 180
ctgtcacaga acggtggtcc cttcatggcg gacgtctatc catacttcag ctacatcggc 240
aacacaaaag acatttctct ggattatgct ctgtttaagt ctacgtctac ggtggtgcaa 300
gacggtgatc acagctacac caacctgttc gatgccatgg gtgatactct t 351

<210> 182
<211> 457
<212> DNA
<213> Pinus radiata

<400> 182
caatcttcca tctccagacg aggtggtaac tttgatgaag tccaacaaca ttgggaaaac 60
gagaatttac caggaaaacg atgttgtact gcaagctttc gcgaattctg gtatcgatgt 120
aatagtgggt gtcgctaacg aagaactgaa gaacatatct tccagccaag actcggcaaa 180
ccgttgggtt aacgagcaca ttgtgccctt ctatcccgcc accaatgtca aatacattgc 240
agtgggaaac gaggttttga aaagcttgga caacgttcag tacataccct atcttgttcc 300
ggccatgaac aacattcaaa ctgcgatcca gaacgctaaa ctgcagaata gcatcaaggt 360
ctctaccacc cacaggccgg atgttagcag cggcaacctg ccgtctgaag gagtcttcat 420
agatgctgta aaggacacga tgagccaaat actcaat 457

<210> 183
<211> 358
<212> DNA
<213> Pinus radiata

<400> 183
ctttgatgaa gtccaacaac attgggaaaa cgagaattta ccaggaaaac aaagttgtac 60
tgcaagcttt ggcgaattct ggtatcgatg taatagtggg tgtcgctaac agcgaactgg 120
aggacatatc ttccagccaa gactcggcaa accgttgggt taacgagaac attgtgccct 180
tctatcccgc caccaatgtc aaatacattg cagtgggaaa cgaagttttg ataggcaacg 240
ttcagtacgt accctatctt gttccggcca tgaagaacat tcaaactgcg atccagaacg 300
ctaaactgca ggatagcatc aaggtctcta ccacccacag gccggatgtt agcagcgg 358

<210> 184
<211> 348
<212> DNA
<213> Pinus radiata

<400> 184

cgtaccctat cttgttccgg ccatgaagaa cattcaaact gcgatccaga acgctaaact 60
ccaggatagc atcaaggtct ctaccaccca caggccggat gttagcagcg gctacccgcc 120
gtctaaagga gtcttcgtag atgctgcgaa ggacacgatg agccaaatac tcaatttttt 180
gtcacagaac ggtggtccct tcatggcgga cgtctatcca tacttcagct acatcggcaa 240
cacaaaagac atttctctgg attatgctct gtttaagtct acgtctacgg tggtgcaaga 300
cggtgatcac agctacacca acctgttcga tgccatggtt gatactct 348

<210> 185
<211> 594
<212> DNA
<213> Pinus radiata

<400> 185
aactttgatg aagtccaaca gcattgggaa aacgagaatt taccaggaaa acaaagttgg 60
actgcaagct ttggcgaatt ctggtatcga tgtaatagtg ggtgtgctaa cagcgaactg 120
gaggacatat cttccagcca agactcggca aaccgttggg ttaacgagaa cattgtgccc 180
ttctatcccg ccaccaatgt caaatacatt gcagtgggaa acgaagtttt gataggcaac 240
gttcagtacg taccctatct tgttccggcc atgaagaaca ttcaaactgc gatccagaac 300
gctaaactgc aggatagcat caaggtctct accacccaca ggccggatgt tagcagcggc 360
tacccgccgt ctaaaggagt cttcgtagat gctgtgaaag acacgatgag ccaaatactc 420
aattttctgt cacagaacgg tggtcccttc atggcggacg tctatccata cttcagctac 480
atcggcaaca caaaagacat ttctctggat tatgctctgt ttaagtctac gtctacgggg 540
tgcaagacgg tgatcacagc tacaccaacc tgttcgatgc catggttgat actc 594

<210> 186
<211> 360
<212> DNA
<213> Eucalyptus grandis

<400> 186
cgacatgttc gacaaggccg ctctcttcgc tttctcttta ctcgccgtca cttacggtca 60
gcaggtcggt acccagactg ctgaatctca tccgcctctt acctggcaaa aatgtacgac 120
tgctggtgga tgtaccaatg tttctggtgg tagtgttgtc attgacgcga attggcgttg 180
ggtccattcc atcaacggta ctactaactg ttacactggt caagcatgga acacgacact 240
ctgtccggat gacacgactt gcgcagccaa ctgcgctttg gatggtgctg attactctgg 300
cacttatggc attactactt ccggcaatgc tcttaccctc aagttcgtca ctcaatcttc 360

<210> 187
<211> 397
<212> DNA
<213> Eucalyptus grandis

<400> 187
atccacccta gcgagcagga tgaggtctct caaatactac ttgaaacttt tagatgtgtc 60
ccgacttttt tgccctctga tttgtttact agatactatc atgggttctg caagcaacag 120
ctttggccat tgttccatta catgttgcct ttgtcgcctg acctcggtgg tcggttcaac 180
cggtccttgt ggcaggctta tgtctccgtc aataagattt tcgcagatag gatcatggaa 240
gtgattaatc cagaggatga tttcgtttgg gtacacgatt accatttgat ggtgttgccg 300
actttcttga ggaaaaggtt caatagagtg aagcttggct tcttccttca cagcccattc 360
ccctcttcag agatttacaa gactctgccg atcaggg 397

<210> 188
<211> 531
<212> DNA
<213> Eucalyptus grandis

<400> 188

ggaagacaaa gagaagagct atatttctgg attatgacgg cactgttgtt cctgaaactt 60
ctatcagtaa aatgccaggg cctgaagtcc tttctgtttt gaacgctctc tgtaatgatc 120
caatgaacac tgtatttatt atcagtgggc gggggagaaa atcattaagt gagtggcttt 180
cttcttgcaa gaagcttgga atagccgctg agcatgggta ttttataagg tggaacagtg 240
cagccgagtg ggaaaccagt tcattgtctg ctgatcttga ttggaagaat accgtggaac 300
ctataatgaa ttcatacaca gaggcaactg atggctcaag catagagtac aaggagagcg 360
ctttggtgtg gcaccatcag gatgcagacc ctgattttgg atcatgccaa gccaaggaat 420
tgttggctca tctagagagt gtgctcgcaa atgaacctgc agttgttaag aggggacagc 480
aaattgtgga ggtcaaacct cagggagtaa gcaaaggatt ggttgcagag a 531

<210> 189
<211> 329
<212> DNA
<213> Eucalyptus grandis

<400> 189
atcctccaga aatcagcttt tgttgtctta ctcctcaaaa agtgaggcac ttgccagttc 60
cttgagaaac gagactacgt cgtcagagga tgtaagcatg tagcgagcat ttgtacgggt 120
ccgcccaaca gcgcatgaga aatagttttc cccttgaga tcgagcacat tccaagatat 180
tttatccgga gatgacctcc tcccactacc actggcatgg ttgttagttc ttttctcagg 240
gtttggtaaa ggtcgttgtg tcttcaccgc agacgctttt gacccgcttt tactagcttg 300
aagcttcaat gaagatcgtt tctcccctg 329

<210> 190
<211> 503
<212> DNA
<213> Eucalyptus grandis

<400> 190
accaaaagcc gagcgattct tttggattat gatggagcta tggggtcaac aggatccaat 60
tccatcagtg tgatacctac tgctgagaca gttggactca ttaacagttt gtgccgagat 120
cccaagaatg ttgtcttcct tgtcagtgga aaggagcgag ttatcctaag taaatggttc 180
tcatcgtgtg atagacttgg gttagcagca gagcatggct attttcttag gccaaaccaa 240
gaaggagatt gggaaacttg tgtttcggtg acagattttg actggaaaca gacagctgag 300
ccggttatga gattatacat ggaaacaact gatggctcta ctatagaaat caaagagagt 360
tcaattgtgt ggaactacca gtgcgcagat ccagattttg gtttttgcca ggcaaaggaa 420
cttttagatc acctggaaag tgttcttgca aatgaacctg tttctgtcaa gagtggccaa 480
cacattgtgg aagttaaacc tca 503

<210> 191
<211> 398
<212> DNA
<213> Eucalyptus grandis

<400> 191
acgacactag aggatccaaa gtctcgcaaa aagggattga ggtcataaat ccagaggatg 60
actatgtctg gatacatgat tatcattgga gggggttgcc tactttctta agaaggaagt 120
tcatcaagct gaggatgggg ttctttctcc atagcccttt tccatcatca gagatatata 180
ggactcttcc agnnagggag gagatactca aagcgcttct taatgctgac ctgattggtt 240
tccacacgtt cgattatgct cggcattttc tatcctgttg cagtagaatc tggggngtgg 300
agtaccagtc gaaaaggggt tatatcggnt tggaatatta tggaagaaca attggggtaa 360
agatcatgcc tgttgggatc cacatgggcc agattcag 398

<210> 191
<211> 457
<212> DNA
<213> Eucalyptus grandis

<400> 192
ggcaggctta tgtctccgtc aataagattt tcgcagatag gatcatggaa gtgattaatc 60
cagaggatga tttcgtttgg gtacacgatt accatttgat ggtgttgccg actttcttga 120
ggaaaaggtt caatagagtg aagcttggct tcttccttca cagcccattc ccctcttcag 180
agatttacaa gactctgccg atcanggagg agcttctgan ggctttcctg aattctgatt 240
tgatagggtt ccacactttc gactatgcac gccatttcct gtcttgttgt agtcggatgc 300
ttggtcttac ctatgaatcg aagaggggtt atataggcct ggactattat ggtcggactg 360
ttagtatcaa aattcttcca gttgggatac acatgggaca attgcagtcc gttttaagcc 420
ttccccgagac tgaagccaag gtggccgaac taattaa 457

<210> 193
<211> 359
<212> DNA
<213> Eucalyptus grandis

<400> 193
gcctgacctc ggtggtcggt tcaaccggtc cttgtggcag gcttatgtct ccgtcaataa 60
gattttcgca gataggatca tggaagtgat taatccagag gatgatttcg tttgggtaca 120
cgattaccat ttgatggtgt tgccgacttt cttgaggaaa aggttcaata gagtgaagct 180
tggcttcttc cttcacagcc cattcccctc ttcagagatt tacaagactc tgccgatcag 240
ggaggagctt ctgagggctt tcctgaattc tgatttgata gggttccaca ctttcgacta 300
tgcacgccat ttcctgtctt gttgtagtcg gatgcttggt cttacctatg aatcgaaga 359

<210> 194
<211> 401
<212> DNA
<213> Eucalyptus grandis

<400> 194
ttggcttctt ccttcacagc ccattcccct cttcagagat ttacaagact ctgccgatca 60
gggaggagct tctgagggct ttcctgaatt ctgatttgat agggttccac actttcgact 120
atgcacgcca tttcctgtct tgttgtagtc ggatgcttgg tcttacctat gaatcgaaga 180
ggggttatat aggcctggac tattatggtc ggactgttag tatcaaaatt cttccagttg 240
ggatacacat gggacaattg cagtccgttt taagccttcc cgagactgaa gccaaggtgg 300
ccgaactaat taagcagttt ggtggtcggg gtaggacaat gttgctcggt gtagatgaca 360
tggatatttt taaaggaatt agcttgaaac tgttggccat g 401

<210> 195
<211> 364
<212> DNA
<213> Eucalyptus grandis

<400> 195
ccgactttct tgaggaaaag gttcaataga gtgaagcttg gcttcttcct tcacagccca 60
ttcccctctt cagagattta caagactctg ccgatcaggg aggagcttct gagggctttc 120
ctgaattctg atttgatagg gttccacact ttcgactatg cacgccattt cctgtcttgt 180
tgtagtcgga tgcttggtct tacctatgaa tcgaagaggg gttatatagg cctggactat 240
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ggtc 364

<210> 196
<211> 400
<212> DNA
<213> Pinus radiata

<400> 196
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tcaaagagat gaagctcctt ttgcatcctg atctgggtga aacccttca gttttatgta 120
aggatccaaa aactactata gttgtgctta gcggaagtga aagaaatgtc ttagatgaga 180
attttggcga actcgacatg tggttagcag cagaaaatgg tatgtttctg cgccatacga 240
aaggagaatg gatgatcaca atgccagaat atcttaatat ggactggatg gagagtgtaa 300
agcttgtttt tgattatttc aaagaaaggc acctcgatcg tatgtngagg ttcgagaaac 360
ctctttagtt tggacctata agtatgcaga tgttgaattt 400

<210> 197
<211> 298
<212> DNA
<213> Eucalyptus grandis

<400> 197
taaaaccgnt agcagcaagt gctgtccatt acaatggtgt attggagtat gatgctcaca 60
gtttgtatgg tttctcgcaa tcaattgcta ctcacaaagc actccaaggg ctccagggaa 120
agagaccctt catattgtcg cgctcgacgt acgtgggctc cgggaagtat gtngctcact 180
ggaccggaga taaccaaggn aattgggaaa atctgaagta ttccatctcc actatgctga 240
atttcggcat attcggagtg ccgatggtcg gtgcagacat atgcgggttc taccccaa 298

<210> 198
<211> 402
<212> DNA
<213> Eucalyptus grandis

<400> 198
ctggaccgga gataaccaag gcaattggga aaatttgaag tattccatct ccactatgct 60
gaattttggc atattcggag tgccgatggt cggtgcagac atatgcggct tctacccggc 120
cccgactgag gagctttgca accgctggat tgaaagtcgg tgccttntac ccnttntttt 180
tngggggggnn ttncccnntt tttttttncc cnaaaagggg tttttaatgg gactcagtag 240
ccgaatctgc taggaatgct cttggcatga gatataggct cctaccttac ttgtacactc 300
tcaattacca agctcatacg acgggagccc cgattgcacg gcctcttttc ttttcattcc 360
ccgattacgt ggagagttac ggattgagca cccagttttt gc 402

<210> 199
<211> 441
<212> DNA
<213> Pinus radiata

<400> 199
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gacgttttca taaagcacga cgggagtccg ttcttgggtc aggtgtggcc cggcgccgtg 120
tactttccgg acttcctgaa cccaaagacg gtggatttct gggccgacga gatctcccgc 180
ttccaccaaa tggtccccgt ggacggtctc tggatcgaca tgaacgaggt ctccaatttc 240
tgcagtggca agtgctccat ccccacaaac cggagctgcc cgggcacggg tttcccatgg 300
gactgctgcc tcgactgcac aaacatcacc gccacccgat gggacgtgcc accctaccag 360
atcaacgcct ccggtaccca ggtcccgctg gggttcaaga ccatcgccac cagctccgtc 420
cactacaacg gcgtcctcga g 441

<210> 200
<211> 481
<212> DNA
<213> Pinus radiata

<400> 200
ctataacaaa tctcagatag ctctggatgt tatatggaac gatgatgacc acatggatgg 60

agccaaagac ttcacccttg accctatcaa ctatcctgaa tataagctgc gtcccttcct 120
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cgggagtccg ttcttgggtc aggtgtggcc cggcgccgtg tactttccgg acttcctgaa 300
cccaaagacg gtggatttct gggccgacga gatctcccgc ttccaccaaa tggtccccgt 360
ggacggtctc tggatcgaca tgaacgaggt ctccaatttc tgcagtggca agtgctccat 420
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a 481

<210> 201
<211> 484
<212> DNA
<213> Pinus radiata

<400> 201
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accataagca tcacggttcc aaatagtcct agtagtgttg gaaggatcga ggcggaaagt 120
gttggtatgt tcgccgagac catagatgtt cgcgttatta gggacgacgg tcttaagtcg 180
gagatattgc tcctcaaaca caagcgtgct acccttggtg tcgaacaaca cctcgccaga 240
ctttttacgg acaacgctga acgagaacgg gctcggaaca tatttgaaga cgatatctgc 300
cgaggacgcc gtgaccttgg atgttggacg ggggaaaacc tcctcgggga cttcatatcg 360
cttgcccgcc gaatcaccaa tcttgacatg aactcgagac tcgtcttcgt acgtaacctg 420
caacttgagc tgctgaacgt cactgccgta gatcccacag gtagcggcga gagtcaggtc 480
agcg 484

<210> 202
<211> 418
<212> DNA
<213> Pinus radiata

<400> 202
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aaatctcaga tacctctgga tgttatatgg aacgatgatg accacatgga tggagccaaa 120
gacttcaccc ttgaccctat caactatcct gaatataagc tgcgtccctt ccttgaccga 180
attcatgcca atggaatgag atatgtcgtc cttatcgacc cagggattgg cgttaacacg 240
agctacggga cgttccagcg aggaatggcg gacgacgttt tcataaagca cgacgggagt 300
ccgttcttgg gtcaggtgtg gcccggcgcc gtgtactttc cggacttcct gaacccaaag 360
acggtggatt tctgggccga cgagatctcc cgcttccacc aaatggtccc cgtggacg 418

<210> 203
<211> 395
<212> DNA
<213> Pinus radiata

<400> 203
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aaatctcaga tacctctgga tgttatatgg aacgatgatg accacatgga tggagccaaa 120
gacttcaccc ttgaccctat caactatcct gaatataagc tgcgtccctt ccttgaccga 180
attcatgcca atggaatgag atatgtcgtc cttatcgacc cagggattgg cgttaacacg 240
agctacggga cgttccagcg aggaatggcg gacgacgttt tcataaagca cgacgggagt 300
ccgttcttgg gtcaggtgtg gcccggcgcc gtgtactttc cggacttcct gaacccaaag 360
acggtggatt tctgggccga cgagatctcc cgctt 395

<210> 204
<211> 390
<212> DNA
<213> Pinus radiata

<400> 204
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ggcggacgac gttttcataa agcacgacgg gagtccgttc ttgggtcagg tgtggcccgg 120
cgccgtgtac tttccggact tcctgaaccc aaagacggtg gatttctggg ccgacgagat 180
ctcccgcttc caccaaatgg tccccgtgga cggtctctgg atcgacatga acgaggtctc 240
caatttctgc agtggcaagt gctccatccc cacaaaccgg agctgcccgg gcacgggttt 300
cccatgggac tgctgcctcg actgcacaaa catcaccgcc acccgatggg acgtgccacc 360
ctaccagatc aacgcctcgg tacccaagtc 390

<210> 205
<211> 245
<212> DNA
<213> Eucalyptus grandis

<400> 205
ccaccgcaga atccccccgg cagtccctgg aatcatgttc ttgtctggtg gacaatctga 60
agttgaagcc accctgaact tgaatgccat gaaccaatcg ncaaacccgt ggcacgnatc 120
tttctcatat gcccgagccc tccagaacac ctgcttgaag acatggggag gaagacccga 180
gaacgtgaag ccagcccagg aaaccttgct tgtccgcgcc aagggcaaat ctcttgctca 240
aactt 245

<210> 206
<211> 510
<212> DNA
<213> Eucalyptus grandis

<400> 206
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tcatccccag tccttgacaa gtccgagtgg gtgaagggtc agtctatccg ccacgcctcg 120
gccaccaccg tgcgctgcca tcctgccacc gcctctgtcc tcactgtcaa agccagtaat 180
gccgatgaac tcgtcaagac cgcgaaaacc atcgcatcgc caggacgtgg aattttggcc 240
atggacgaat caaatgccac ttgcgggaag cgtcttgcct cgattggact agagaacacc 300
gaagccaacc gccaagccta cagaactctg ctggtgacag ttccagggct cggcgagtac 360
atctccggtg ccatcctctt cgaggagact ctctaccagt ccacagtcga tggacgcaag 420
atggttgatg tacttgttga gcagaacatc gtccccggta tcaaagtcga caagggttgg 480
tgctttggcg gtttaacaat gagtctggtg 510

<210> 207
<211> 413
<212> DNA
<213> Eucalyptus grandis

<400> 207
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cccgcacggc tgcttactac cagcagggtg cacgctttgc taaatggaga actgtggtga 120
gcatccccaa tggcccatct gccctggccg tgaaggaagc cgcctggggt cttgcccgct 180
acgctgccat ttgccaagac aatggattga ccccaatagt ggagccggag atcttgctgg 240
atggagagca cgggatcgag aggacattcg aggtggccct gaaggtgtgg gcggaggtgt 300
tctactacat ggctgagaac aatgtactgt tcgagggcat cctcttgaag cccagcatgg 360
tcactcccgg cgctgagtgc aaagagaggg ccactcccca gcaagtggcc gag 413

<210> 208
<211> 434
<212> DNA
<213> Eucalyptus grandis

<400> 208
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ctcaatgcca tgaacaagct caagggcaag aaaccatggt ctctttcctt ctcctttgga 120
cgggctcttc agcagagcac tttgaagtct tgggntggaa aggaggagaa cgtgcccaag 180
gcacaggctg cattatttac taggtgcaag gcaaactcag aggcaactct tggtacttac 240
aagggtgacg caaagcttgg cgagggagct gctgaaagtc tccatgttaa ggattacaag 300
tactaaggtg cttttgctgg cggtattttc tgcttttcat ttgagaaaaa taggtgtctg 360
gagatatcct atttttgtac taggataata agcatgactg tactgtactg gtaatgcatt 420
ttcattgatg ttgt 434

<210> 209
<211> 350
<212> DNA
<213> Eucalyptus grandis

<400> 209
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tgtatgttcc aagagttgcg tccgagttgg ccttgcatct tctgagaagt gcagcctgtg 120
ccttgggaat gttctcttcc tttccagccc acgccttcaa ggtgctctgc tgtagggccc 180
gaccaaaaga gaaggagagg ctccatggct tcttgccctt gagcttgttc atggcattga 240
ggttcaaagt ggcctcctcc tcactctgcc caccggacaa gaagacaatg gccggaacag 300
caggaggcac tgttcgctgc agggcacgaa cggtgtactc agcaatgacc 350

<210> 210
<211> 455
<212> DNA
<213> Eucalyptus grandis

<400> 210
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gtttgtgaag ggcacgcaga ctctccgcac cccatctctc gccgccgtcc gctaccaccc 120
caccaccgcc ccctccgctc tcgtcgtcaa agccagtgcc tatgctgatg agctcgtcaa 180
gactgcgaaa acagttgcat cacccgggag aggaatcctg gccatggacg agtcaaacgc 240
aacctgcggg aagcgtttgg cgtcgatcgg gctagagaac accgaggcca accgccaggc 300
ctacaggaca ctcctggtca gtgctccggg gcttggccag tacatctctg gtgctatcct 360
cttcgaggag actctctacc aatccaccac cgacggccgc aagatggtcg acgtcctcgt 420
tgagcagaac attgtccctg gtattaaagt cgaca 455

<210> 211
<211> 509
<212> DNA
<213> Eucalyptus grandis

<400> 211
ggagggagaa gctttgagaa gagataaggt aacacagttt ttgcttgccg ggctgtgctc 60
gagtttggcc tttgcaagcg aaaaacaatg gcctcggctt ctctcctcaa gtcatctccc 120
gtgctcgaca agtcggagtt tgtgaagggc acgcagactc tccgcacccc atctctcgcc 180
gccgtccgct accaccccac caccgccccc tccgctctcg tcgtcaaagc cagtgcctat 240
gctgatgagc tcgtcaagac tgcgaaaaca gttgcatcac ccgggagagg aatcctggcc 300
atggacgagt caaacgcaac ctgcgggaag cgtttggcgt cgatcgggct agagaacacc 360
gaggccaacc gccaggccta caggacactc ctggtcagtg ctccggggct tggccagtac 420
atctctggtg ctatcctctt cgaggagact ctctaccaat ccaccaccga cggccgcaag 480
atggtcgacg tcctcgttga gcagaacat 509

<210> 212
<211> 364
<212> DNA

<213> Eucalyptus grandis

<400> 212
atttgaagtt gctcagaagg tttgggctga ggttttctac tacctggctg agaacaatgt 60
catgtttgag ggtatcctcc ttaagcccag catggtcact cctggtgccg agtgcaagga 120
caaggccact cctcaacaag tcgctgaata caccctcaag cttctccacc gcagaatccc 180
cccggcagtc cctggaatca tgttcttgtc tggtggacaa tctgaagttg aagccaccct 240
gaacttgaat gccatgaacc aatcgccaaa cccgtggcac gtatctttct catacgcccg 300
agccctccag aacacctgct tgaagacatg gggaggaaga cccgagaacg tgaagccagc 360
ccag 364

<210> 213
<211> 372
<212> DNA
<213> Eucalyptus grandis

<400> 213
ctgaagttga agccaccctg aacttgaatg ccatgaacca atcgccaaac ccgtggcacg 60
tatctttctc atacgcccga gccctccaga acacctgctt gaagacatgg ggaggaagac 120
ccgagaacgt gaagccagcc caggaaacct tgcttgtccg cgccaaggcc aactctcttg 180
ctcagcttgg caagtacaca ggtgagggcg agtccgagga ggccaagaaa ggaatgttcg 240
tcaagggcta cgtgtattaa gctgttcact gtaggtggaa gtggatgatc aaagttggga 300
gacttaagaa ttgatccctc tcagcgtgtt atgattatag ccacggagac tatttttgca 360
catcgaatgt ac 372

<210> 214
<211> 471
<212> DNA
<213> Eucalyptus grandis

<400> 214
atattaacct cctcatataa aaatataaaa cttcataaag aagtcgcaaa cattcaacca 60
tcacaacatc aatgaaaatg cattaccagt acagtcatgc ttattatcct agtacaaaaa 120
taggatatct ccagacacct atttttctta aaaggaaaag cagaaaatac cgccagcaaa 180
aaagcacctt agtacttgta atccttaaca tggagacttt cagcagctcc ctcgccaagc 240
tttgcgtcac ccttgtaagt accaagagtt gcctctgagt ttgccttgca cctagtaaat 300
aatgcagcct gtgccttggg cacgttctcc tcctttccag cccaagactt caaagtgctc 360
tgctgaagag cccgtccaaa ggagaaggaa agagaccatg gtttcttgcc cttgagcttg 420
ttcatggcat tgaggttgag ggttgcctcc tcctcactct gcccaccaga c 471

<210> 215
<211> 465
<212> DNA
<213> Eucalyptus grandis

<400> 215
acggtcagta atccacgaaa caaacgaagc acaagtaata gtatcgcagc aaagcctaga 60
tccgcccctc agtacttgta gtccttaaca tggagagact cggaagcacc ctcgccaagt 120
tgagcatcac ccttgtatgt tccaagagtt gcgtccgagt tggccttgca tcttctgaga 180
agtgcagcct gtgccttggg aatgttctct tcctttccag cccacgcctt caaggtgctc 240
tgctgtaggg cccgaccaaa agagaaggag aggctccatg gcttcttgcc cttgagcttg 300
ttcatggcat tgaggttcaa agtggcctcc tcctcactct gcccaccgga caagaagaca 360
atggccggaa cagcaggagg cactgttcgc tgcagggcac gaacggtgta ctcagcaatg 420
acctccggag caaccttggg ggcatctgat ccgggggtga ccatg 465

<210> 216
<211> 484

<212> DNA
<213> Eucalyptus grandis

<400> 216
ctcatataaa aatataaaac ttcataaaga agtcgcaaac attcaaccat cacaacatca 60
atgaaaatgc attaccagta cagtcatgct tattatccta gtacaaaaat aggatatctc 120
cagacaccta tttttctcaa atgaaaagca gaaaataccg ccagcaaaaa agcaccttag 180
tacttgtaat ccttaacatg gagactttca gcagctccct cgccaagctt tgcgtcaccc 240
ttgtaagtac caagagttgc ctctgagttt gccttgcacc tagtaaataa tgcagcctgt 300
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cgtccaaagg agaaggaaag agaccatggt ttcttgccct tgagcttgtt catggcattg 420
aggttgaggg ttgcctcctc ctcactctgc ccaccagaca aaaacacaac ggcagggaca 480
gccg 484

<210> 217
<211> 362
<212> DNA
<213> Eucalyptus grandis

<400> 217
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agcatcaccc ttgtatgttc caagagttgc gtccgagttg gccttgcatc ttctgagaag 120
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catggcattg aggttcaaag tggcctcctc ctcactctgc ccaccggaca agaagacaat 300
ggccggaaca gcaggaggca ctgttcgctg cagggcacga acggtgtact cagcaatgac 360
ct 362

<210> 218
<211> 395
<212> DNA
<213> Eucalyptus grandis

<400> 218
ccttaacatg gagagactcg gaagcaccct cgccaagttg agcatcaccc ttgtatgttc 60
caagagttgc gtccgagttg gccttgcatc ttctgagaag tgcagcctgt gccttgggaa 120
tgttctcttc ctttccagcc cacgccttca aggtgctctg ctgtagggcc cgaccaaaag 180
agaaggagag gctccatggc ttcttgccct tgagcttgtt catggcattg aggttcaaag 240
tggcctcctc ctcactctgc ccaccggaca agaagacaat ggccggaaca gcaggaggca 300
ctgttcgctg cagggcacga acggtgtact cagcaatgac ctccggagca accttggggg 360
cattgatccg gggtgacca tgttgggctt caaca 395

<210> 219
<211> 416
<212> DNA
<213> Eucalyptus grandis

<400> 219
cgtccctcag tacttgtagt ccttaacatg gagagactcg gaagcaccct cgccaagttg 60
agcatcaccc ttgtatgttc caagagttgc gtccgagttg gccttgcatc ttctgagaag 120
tgcagcctgt gccttgggaa tgttctcttc ctttccagcc cacgccttca aggtgctctg 180
ctgtagggcc cgaccaaaag agaaggagag gctccatggc ttcttgccct tgagcttgtt 240
catggcattg aggttcaaag tggcctcctc ctcactctgc ccaccggaca agaagacaat 300
ggccggaaca gcaggaggca ctgttcgctg cagggcacga acggtgtact cagcaatgac 360
ctccggagca accttggggg catctgatcc gggggtgacc atgttgggct tcaaca 416

<210> 220

<211> 452
<212> DNA
<213> Eucalyptus grandis

<400> 220
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tccgcccctc agtacttgta gtccttaaca tggagagact cggaagcacc ctcgccaagt 120
tgagcatcac ccttgtatgt tccaagagtt gcgtccgagt tggccttgca tcttctgaga 180
agtgcagcct gtgccttggg aatgttctct tcctttccag cccacgcctt caaggtgctc 240
tgctgtaggg cccgaccaaa agagaaggag aggctccatg gcttcttgcc cttgagcttg 300
ttcatggcat tgaggttcaa agtggcctcc tcctcactct gcccaccgga caagaagaca 360
atggccggaa cagcaggagg cactgttcgc tgcagggcac gaacggtgta ctcagcaatg 420
acctccggag caaccttggg ggcatctgat cc 452

<210> 221
<211> 289
<212> DNA
<213> Eucalyptus grandis

<400> 221
ctcagtactn gtagtcctta acatggagag actcggaagc accctcgcca agttgagcat 60
caccсttgna tgttccaaga gttgcgtccg agttggcctt gcatcttctg agaagtgcag 120
cctgtgcctt gggaatgttc tcttcctttc cagcccacgc cttcaaggtg ctctgctgta 180
gggcccgacc aaaagagaag gagaggctcc atggcttctt gcccttgagc ttgttcatgg 240
cattgaggtt caaagnggcc tcctcctcac tctgcccacc ggacaagaa 289

<210> 222
<211> 460
<212> DNA
<213> Eucalyptus grandis

<400> 222
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cccgccgcgt ctccgccccg atccgcgccg ccgcttactc cgacgagctc gtccagaccg 120
ccaaatccat tgcatctcct ggtcgtggta tccttgccat tgatgagtca aatgcaacat 180
gtgggaaaag gttagcatcc atcgggttgg acaacactga ggtcaatcgt caagcttata 240
gacaacttct gttgaccacg cctggtctgg gtgaatacat ctctggtgcc attttgtttg 300
aggagacact ttaccaatcg acaacagatg ggaagaaatt tgttgactgc ctgcgtgagg 360
agaaaattgt tccaggcatt aaagttgaca agggtttggt tcctcttcct ggatccaata 420
atgaatcctg gtgccaaggc ttggatggat tggcttcaag 460

<210> 223
<211> 373
<212> DNA
<213> Eucalyptus grandis

<400> 223
cgtccctcag tacttgtagt ccttaacatg gagagactcg gaagcaccct cgccaagttg 60
agcatcaccc ttgtatgttc caagagttgc gtccgagttg gccttgcatc ttctgagaag 120
tgcagcctgt gccttgggaa tgttctcttc ctttccagcc cacgccttca aggtgctctg 180
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catggcattg aggttcaaag tggcctcctc ctcactctgc ccaccggaca agaagacaat 300
ggccggaaca gcaggaggca ctgttcgctg cagggcacga acggtgtact cagcaatgac 360
ctccggacaa cct 373

<210> 224
<211> 524

<212> DNA
<213> Eucalyptus grandis

<400> 224
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cccgccgcgt ctccgccccg atccgcgccg ccgcttactc cgacgagctc gtccagaccg 120
ccaaatccat tgcatctcct ggtcgtggta tccttgccat tgatgagtca aatgcaacat 180
gtgggaaaag gttagcatcc atcgggttgg acaacactga ggtcaatcgt caagcttata 240
gacaacttct gttgaccacg cctggtctgg gtgaatacat ctctggtgcc attttgtttg 300
aggagacact ttaccaatcg acaacagatg ggaagaaatt tgttgactgc ctgcgtgagg 360
agaaaattgt tccaggcatt aaagttgaca agggtttggt tcctcttcct ggatccaata 420
atgaatcctg gtgccaaggc ttggatggat tggcttcaag gtccgctgaa tactacaagc 480
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<210> 225
<211> 332
<212> DNA
<213> Eucalyptus grandis

<400> 225
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tccgcccctc agtacttgta gtccttaaca tggagagact cggaagcacc ctcgccaagt 120
tgagcatcac ccttgtatgt tccaagagtt gcgtccgagt tggccttgca tcttctgaga 180
agtgcagcct gtgccttggg aatgttctct tcctttccag cccacgcctt caaggtgctc 240
tgctgtaggg cccgaccaaa agagaaggag aggctccatg gcttcttgcc cttgagcttg 300
ttcatggcat tgaggttcaa agtggcctcc tc 332

<210> 226
<211> 362
<212> DNA
<213> Eucalyptus grandis

<400> 226
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agcatcaccc ttgtatgttc caagagttgc gtccgagttg gccttgcatc ttctgagaag 120
tgcagcctgt gccttgggaa tgttctcttc ctttccagcc cacgccttca aggtgctctg 180
ctgtagggcc cgaccaaaag agaaggagag gctccatggc ttcttgccct tgagcttgtt 240
catggcattg aggttcaaag tggcctcctc ctcactctgc ccaccggaca agaagacaat 300
ggccggaaca gcaggaggca ctgttcgctg cagggcacga acggtgtact cagcaatgac 360
ct 362

<210> 227
<211> 506
<212> DNA
<213> Eucalyptus grandis

<400> 227
gtcactcccg gcgctgagtg caaagagagg gccactcccc agcaagtcgc cgagtacacc 60
ctcaagctcc tccaccgcag gatcccgcct gccgttcccg gaatcatgtt cttgtctggt 120
gggcaatccg aggtcgaagc aaccctgaac ctgaacgcga tgaaccagtc cccgaaccca 180
tggcacgtgt ccttctccta cgctagagcc ctccagaaca cctgcttgaa gacgtgggga 240
ggcaggcccg agaacgtgaa ggccgctcag gatacgctcc tggtccgtgc caaggccaac 300
tccctcgccc agctcggcaa gtacaccggt gaaggcgagt ctgaggaggc caagaaggga 360
atgttcgtca agggatacgt gtactaaggc gatgcactga aactccatga gctcagaaga 420
tgatcacagg tttagttatg ataatgatgg tggcggatgg agcattggaa gctatgaaga 480
agtagaacag ctaattcctc cttcct 506

<210> 228
<211> 283
<212> DNA
<213> Eucalyptus grandis

<400> 228
ttgacaaggg tttggttcct cttcctggat ccaataacga atcctggtgc caaggcttgg 60
atggattggc ttcaaggtcc gctgaatact acaagcaagg tgctcgtttt gccaaatgga 120
ggacagtggt tagcattcct tgtggtccct ctgctcttgc agtaaaagaa gctgcgtggg 180
gacttgcacg atatgctgcc atctctcagg ataatggcct tgtgcccatt gttgaacctg 240
agattcttct tgatggagac caccctattg agaggactct tga 283

<210> 229
<211> 450
<212> DNA
<213> Eucalyptus grandis

<400> 229
gtcactcccg gcgctgagtg caaagagagg gccactcccc agcaagtcgc cgagtacacc 60
ctcaagctcc tccaccgcag gatcccgcct gccgttcccg gaatcatgtt cttgtctggt 120
gggcaatccg aggtcgaagc aaccctgaac ctgaacgcga tgaaccagtc cccgaaccca 180
tggcacgtgt ccttctccta cgctagagcc ctccagaaca cctgcttgaa gacgtgggga 240
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tccctcgccc agctcggcaa gtacaccggt gaaggcgagt ctgaggaggc caagaaggga 360
atgttcgtca agggatacgt gtactaaggc gatgcactga aactccatga gctcagaaga 420
tgatcacagg gtttagttat gataatgatg 450

<210> 230
<211> 417
<212> DNA
<213> Eucalyptus grandis

<400> 230
gtcactcccg gcgctgagtg caaagagagg gccactcccc agcaagtcgc cgagtacacc 60
ctcaagctcc tccaccgcag gatcccgcct gccgttcccg gaatcatgtt cttgtctggt 120
gggcaatccg aggtcgaagc aaccctgaac ctgaacgcga tgaaccagtc cccgaaccca 180
tggcacgtgt ccttctccta cgctagagcc ctccagaaca cctgcttgaa gacgtgggga 240
ggcaggcccg agaacgtgaa ggccgctcag gatacgctcc tggtccgtgc caaggccaac 300
tccctcgccc agctcggcaa gtacaccggt gaaggcgagt ctgaggaggc caagaaggga 360
atgttcgtca agggatacgt gtactaaggc gatgcactga aactccatga gctcaga 417

<210> 231
<211> 663
<212> DNA
<213> Eucalyptus grandis

<400> 231
aaatggcctg cgccagcttc gccaagctca acgccacctc ctcccagtgg atcgccgggc 60
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ccgcccccgat ccgcgccgcc gcttactccg acgagctcgt ccagaccgcc aaatccattg 180
catctcctgg tcgtggtatc cttgccattg atgagtcaaa tgcaacatgt gggaaaaggt 240
tagcatccat cgggttggac aatactgagg tcaatcgtca agcttataga caacttctgt 300
tgaccacgcc tggtctgggt gaatacatct ctggtgccat tttgtttgag gagacacttt 360
accaatcgac aacagatggg aagaaatttg ttgactgcct gcgtgaggag aaaattgttc 420
caggcattaa agttgacaag ggtttggttc ctcttcctgg atccaataac gaatcctggt 480
gccaaggctt ggatggattg gcttcaaggt ccgctgaata ctacaagcaa ggtgctcgtt 540
ttgccaaatg gaggacagtg gttagcattc cttgtggtcc ctctgctctt gcagtaaaag 600

aagctgcgtg gggacttgca cgatatgctg gcatctctca ggataatggc cttgtgccca 660
ttg 663

<210> 232
<211> 435
<212> DNA
<213> Eucalyptus grandis

<400> 232
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gcagaaaata ccgccagcaa aagcacctta gtacttgtaa tccttaacat ggagactttc 120
aacagctccc tcgccaagct ttgcgtcacc cttgtaagta ccaagagttg cctctgagtt 180
tgccttgcac ctagtaaata atgcagcctg tgccttgggc acgttctcct cctttccagc 240
ccaagacttc aaagtgctct gctgaagagc ccgtccaaag gagaaggaaa gagaccatgg 300
tttcttgccc ttgagcttgt tcatggcatt gaggttgagg gttgcctcct tctcactctg 360
cccaccagac aaaaacacaa cggcagggac agccggaggc atagtacgtt gaaaggcacg 420
aacagtgtac tcagc 435

<210> 233
<211> 352
<212> DNA
<213> Eucalyptus grandis

<400> 233
acttgtagtc cttaacatgg agagactcgg aagcaccctc gccaagttga gcatcaccct 60
tgtatgttcc aagagttgcg tccgagttgg ccttgcatct tctgagaagt gcagcctgtg 120
ccttgggaat gttctcttcc tttccagccc acgccttcaa ggtgctctgc tgtagggccc 180
gaccaaaaga gaaggagagg ctccatggct tcttgccctt gagcttgttc atggcattga 240
ggttcaaagt ggcctcctcc tcactctgcc caccggacaa gaagacaatg gccggaacag 300
caggaggcac tgttcgctgc agggcacgaa cggtgtactc agcaatgacc tc 352

<210> 234
<211> 330
<212> DNA
<213> Pinus radiata

<400> 234
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atgggccttc ggagttagct gtgaaggaag ctgcgtgggg acttgcacgt tatgccgcta 120
tctctcagga caatggtctt gtgcccattg tggagccaga gattcttctg gatggagacc 180
attgcattga cagaagcctt gaagtggcgg agaaagtctg ggctgaggtt ttcttttact 240
tggcacagaa caatgtgttg tttgagggta ttttgttaaa gccaagtatg gtgactcctg 300
gtgctgagca caaggagaga gcaacccccg 330

<210> 235
<211> 301
<212> DNA
<213> Pinus radiata

<400> 235
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ggttgaggca acattgaatt tgaatgcaat gaaccaaagc ccaaacccat ggcatgtttc 180
cttttcatat gcacgtgcct tgcagaatac atctctcaag acctgaaagg gtcttccaga 240
gactgttgaa gcagctcaga gggcgcttct tattcgggcc aaggataatt ctctggccca 300
g 301

<210> 236
<211> 368
<212> DNA
<213> Pinus radiata

<400> 236
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cggagttagc tgtgaaggaa gctgcgtggg gacttgcacg ttatgccgct atctctcagg 120
acaatggtct tgtgcccatt gtggagcnag agattcttct ggatggagac cattgcattg 180
acagaagcct tgaagtggcg gagaaagtct gggctgaggt tttcttttac ttggcacaga 240
acaatgtgtt gtttgagggt attttgttaa agccaagtat ggtgactcct ggtgctgagc 300
acaaggagag agcaaccccc gaaaaggttg cagagtacac tctaaaaatg cttaagagga 360
gggtgcca 368

<210> 237
<211> 423
<212> DNA
<213> Pinus radiata

<400> 237
gacttgaaga acacggaggc gaaccgacag ggcatacagg cagctgctcg ttcagcgcgc 60
cgggtctcgg acagtacatc tccggcgcca ttctcttcga ggaaactctg taccagtcca 120
gcaccgaagc aagaagattg tagacatcct cgtgcaacag aacatagtcc ccggcatcaa 180
agttgacaag ggtctggttc ctttggctgg ttcaaacgac gaatcttggt gccaaggcct 240
agacggcctc gcatcaaggt gcgctgagta ttataagcaa ggagctcgct tcgccaaatg 300
gcgtacagtt gtgagcattc ccaacggccc ctctgctctg gccgtgaaag aagccgcatg 360
gggtctcggc cgcaacgggc aattgctcag gacaacggtc tggttccata gtggagcaga 420
gat 423

<210> 238
<211> 352
<212> DNA
<213> Pinus radiata

<400> 238
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tggcacagaa caatgtgttg tttgagggta ttttgttaaa gcccagtatg gtgactcctg 120
gtgctgagca caaggagaga gcaacccctg aaaaggttgc agagtacact ctaaaaatgc 180
ttaagaggag ggtgccacca gctgttcctg gggttatgtt cttgtctgga ggacagtctg 240
aggttgaggc aactttgaat ttgaatgcaa tgaaccaaag cccaaatcca tggcatgttt 300
ccttttcata tgcacgtgcc ttgcagaata catcnctcaa gacctggaag gg 352

<210> 239
<211> 427
<212> DNA
<213> Pinus radiata

<400> 239
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tcccgggaga ggcatcctgg cgatggacga gtccaacgcc acctgtggga aacggctggc 120
gtccatcggg cttgagaaca cggaggcgaa ccgacaggca tacaggcagc tgctcgtcag 180
cgcgccgggt ctcggacagt acatctccgg cgccattctc ttcgaggaaa ctctgtacca 240
gtccagcacc gaaggcaaga agattgtaga catcctcgtg caacagaaca tagtccccgg 300
catcaaagtt gacaagggtc tggttccttt ggctggttca aacgacgaat cttggtgcca 360
aggcctagac ggcctcgcat caaggtgcgc tgagtattat aagcaaggag ctcgcttcgc 420
caaatgg 427

<210> 240
<211> 470
<212> DNA
<213> Pinus radiata

<400> 240
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gagggtgcca ccagctgttc ctggggttat gttcttgtct ggaggacagt ctgaggttga 120
ggcaacattg aatttgaatg caatgaacca aagcccaaac ccatggcatg tttccttttc 180
atatgcacgt gccttgcaga atacatctct caagacctgg aagggtcttc cagagaatgt 240
tgaagcagct cagagggcgc ttcttattcg ggccaaggct aattctctgg cccagcttgg 300
gcgatactct gctgaaggtg aaagtgagga gtctaagaag ggaatgttcg ttaagggata 360
cacatattaa gaatgtgggt catagttttc ttacgggaag aactcgttca atgcggatag 420
gttaagcttt tatgtttatt tanttggcac ttacaatcct gaacttttta 470

<210> 241
<211> 396
<212> DNA
<213> Pinus radiata

<400> 241
gattgctggt tccatccttt ttgcaacaga ccctatacca gtaccacaac cgacgggagg 60
aaatttgttg actgtttgcg agagcagaat attatgcccg gcatcaaagt tgacaagggt 120
ttagttccac tgccaggatc aaacaatgaa tcttggtgcc agggtttgga tggattagcc 180
tcaagatctg ctgagtacta caaacagggt gcaagatttg ctaaatggcg aacagttgtc 240
agcataccca atgggccttc ggagttagct gtgaaggaag ctgcgtgggg acttgcacgt 300
tatgccgcta tctctcagga caatggtctt gtgcccattg tggagccaga gattcttctg 360
gatggagacc attgcattga cagaagcttg aagtgg 396

<210> 242
<211> 273
<212> DNA
<213> Pinus radiata

<400> 242
aacaatgtgt tgtttgangg tattttgtta aagccaagta tggtgactcc tggtgctgag 60
cacaaggaga gagcaacccc cgaaaaggtt gcagagtaca ctctaaaaat gcttaagagg 120
agggtgccac cagctgttcc tggggttatg ttcttgtctg gaggacagtc tgaggttgag 180
gcaacattga atttgaatgn aatgaaccaa agcccaaacc catggcatgt ttccttttca 240
tatgcacgtg ccttgcagaa tacatctctc aag 273

<210> 243
<211> 557
<212> DNA
<213> Pinus radiata

<400> 243
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cattgtggag ccagagattc ttctggatgg agaccattgc attgacagaa gccttgaagt 120
ggcggagaaa gtctgggctg aggttttctt ttacttggca cagaacaatg tgttgtttga 180
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ccctgaaaag gttgcagagt acactctaaa aatgcttaag aggagggtgc caccagctgt 300
tcctggggtt atgttcttgt ctggaggaca gtctgaggtt gaggcaactt tgaatttgaa 360
tgcaatgaac caaagcccaa atccatggca tgtttccttt tcatatgcac gtgccttgca 420
gaatacatct ctcaagacct ggaagggtct tccagagaat gttgaagcag ctcagagggc 480
gcttcttatt cgggccaagg ctaattctct ggcccagctt gggcgatact ctgctgaagg 540
tgaaagtgag gagtcta 557

<210> 244
<211> 593
<212> DNA
<213> Pinus radiata

<400> 244
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ccagcaccga aggcaagaag attgtagaca tcctcgtgca acagaacata gtccccggta 120
tcaaagttga caagggtctg gttcctttgg ctggttcaaa cgacgaatct tggtgccaag 180
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aatggcgtac agttgtgagc attcccaacg gcccctctgc tctggccgtg aaagaagccg 300
catggggtct cgcccgctac gcggcaattg ctcaggacaa cggtctggtt cccatagtgg 360
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aggtgtggtc cgaggtgttc ttctacctag cagagaacaa cgtgctgttc gaaggcattc 480
tgctgaagcc aagcatggtt acccctggtg cccgaatgta aggagagggc cagtcccgaa 540
actgttgccc aatataccct gaaccttctc cgaagaagaa ttccaccggc cgt 593

<210> 245
<211> 485
<212> DNA
<213> Pinus radiata

<400> 245
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ccagcaccga aggcaagaag attgtagaca tcctcgtgca acagaacata gtccccggta 120
tcaaagttga caagggtctg gttcctttgg ctggttcaaa cgacgaatct tggtgccaag 180
gcctagacgg cctcgcatca aggtgcgctg agtattataa gcaaggagct cgcttcgcca 240
aatggcgtac agttgtgagc attcccaacg gcccctctgc tctggccgtg aaagaagccg 300
catggggtct cgcccgctac gcggcaattg ctcaggacaa cggtctggtt cccatagtgg 360
agccagagat catgttggat ggagaacacg gcattgagag gactttcgaa gtagcgctga 420
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tgctg 485

<210> 246
<211> 477
<212> DNA
<213> Pinus radiata

<400> 246
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agtactacaa acagggtgca agatttgcta aatggcgaac agttgtcagc atacccaatg 120
ggccttcgga gttagctgtc aaggaagctg cgtggggact tgcacgttat gctgctatct 180
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cacagaacaa tgtgttgttt gagggtattt tgttaaagcc cagtatggtg actcctggtg 360
ctgagcacaa ggagagagca acccctgaaa aggttgcaga gtacactcta aaaatgctta 420
agaggagggt gccaccagct gtcctggggt tatgttcttg tctggaggac agtctga 477

<210> 247
<211> 337
<212> DNA
<213> Pinus radiata

<400> 247
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cgaatcttgg tgccaaggcc tagacggcct cgcatcaagg tgcgctgagt attataagca 120

aggagctcgc ttcgccaaat ggcgtacagt tgtgagcatt cccaacggcc cctctgctct 180
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tctggttccc atagtggagc cagagatcat gttggatgga gaacacggca ttgagaggac 300
tttcgaagta gcgctgaagg tgtggtccga ggtgttc 337

<210> 248
<211> 452
<212> DNA
<213> Pinus radiata

<400> 248
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atggtgactc ctggtgctga gcacaaggag agagcaaccc ccgaaaaggt tgcagagtac 120
actctaaaaa tgcttaagag gagggtgcca ccagctgttc ctggggttat gttcttgtct 180
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agggtcttcc agagaatgtt gaagcagctc agagggcgct tcttattcgg gccaaggcta 360
attctctggc ccagcttggg cgatactctg cttgaaggtg aaagtgagga gtctaagaag 420
ggaatgttcg ttaagggata cacatattaa ga 452

<210> 249
<211> 358
<212> DNA
<213> Pinus radiata

<400> 249
cagaatacac agtaagggct cttcagagga ctgtgccacc tgcagtgccc ggcataatgt 60
ttctatctgg tgggcagagt gaggaggagg ccaccttgaa cttgaatgcc atgaacaagc 120
tgcagaccaa gaagccctgg acattgncat tctcctttgg ccgggctctt caggccagca 180
ctttgaagac atgggctgga aaggatgaga atattcctgc ggctcaggct gccttgttat 240
ctcgatgcaa ggccaattct gatgccactt tgggcaagta tgcaggtgat tctgctaagg 300
gcaatggtgt ttctgagagc cttcatgtca aggactataa gtattgattg atgaccac 358

<210> 250
<211> 341
<212> DNA
<213> Pinus radiata

<400> 250
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gaataagaag cgccctctga gctgcttcaa cattctctgg aagacccttc caggtcttga 180
gagatgtatt ctgcaaggca cgtgcatatg aaaaggaaac atgccatggg tttgggcttt 240
ggttcattgc attcaaattc aatgttgcct caacctcaga ctgtcctcca gacaagaaca 300
taaccccagg aacagctggt ggcaccctcc tcttaagcat t 341

<210> 251
<211> 408
<212> DNA
<213> Pinus radiata

<400> 251
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aaatcaagtg ggttggaacc cagtatacgt ggaagctatc ttggtgttat tgaaaagatt 120
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gcagcttcat tagaatttaa gaaaatggtc aaggccttgc atagtgcagg aattgaggtt 360
attttggatg tggtttacaa ccatacaaat gaagcggatg atgagcat 408

<210> 252
<211> 537
<212> DNA
<213> Eucalyptus grandis

<400> 252
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gttatccatc atacccagag caaaatggga catggaaatt tccaggaatt ggagcttttc 180
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tctttgagaa tacaggaaca aagatttcag tcaaggttgc aggaatttca ctggcactat 480
ggaacgccgt tcgcatgctc ctgagctgac agcaggatac tacaacacac gttatcg 537

<210> 253
<211> 466
<212> DNA
<213> Eucalyptus grandis

<400> 253
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ctgatgctgg tcactataac aactggccag aggatgcccc attcttcaaa aaggaaggtg 120
gaggatggaa cagtcaatat ggtgaattct tcttgtcgtg gtattctcag atgctactgg 180
accatggtga gagaatactc tcatctgcca aatcagtctt tgagaataca ggaacaaaga 240
tttcagtcaa ggttgcagga attcactggc actatggaac gcgttcgcat gctcctgagc 300
tgacagcagg atactacaac acacgttatc gggatggtta ccttccccatt gcccagatgt 360
tggcacggca cggtgctata ttcaacttca cttgcatcga aatgcgtgac cacgagcaac 420
cccaagatgc gctctgcgca cctgagaagc tggtgaagca agtagc 466

<210> 254
<211> 364
<212> DNA
<213> Eucalyptus grandis

<400> 254
agatggcgaa gaagcatggg ttgaaagtgc aggctgtgat gtcgtttcac cagtgcggtg 60
gaaacgttgg tgactcttgc tccatccctc taccaaagtg ggctgtggaa gaagttgata 120
aagatccaga tcttgcatat acagaccagt ggggtaggag aaactacgag tacatatcgc 180
ttggctgtga caccctcccg gttctcaaag ggcgaacacc tgtacagtgt tatgctgact 240
tcatgcgtgc atttagagac aacttccagc accttttagg tgaaaccatt gtggaaattc 300
aagtaggcat ggggccagca ggcgaacttc gttatccatc ataccccgag caaaatggga 360
catg 364

<210> 255
<211> 379
<212> DNA
<213> Eucalyptus grandis

<400> 255
ccagcatata cagaccagtg ggtaggaga aactacgagt acatatcgct tggctgggac 60
accctcccgg ttctcaaagg gcgaacacct gtacagtgtt atgctgactt catgcgtgca 120
tttagagaca acttccagca ccttttaggt gaaaccattg tggaaattca agtaggcatg 180

gggccagcag gcgaacttcg ttatccatca taccccgagc aaaatgggac atggaaattt 240
ccaggaattg gagcttttca atgttacgac aagtacatgc tgagtagctt gaaagctgca 300
tccgaggctg ctggcaaagc agaatggggc cacaccggtc caactgatgc tggtcactat 360
aacaactggc cagaggatg 379

<210> 256
<211> 370
<212> DNA
<213> Eucalyptus grandis

<400> 256
gaagctttcg tgcagagttc aatgactact ttgaggatgg tataatatca atgattggga 60
ttggattggg tccttgtggg gagttacggt acccatcaaa ccctgtaaaa aatggttgga 120
gatatcctgg gataggtgaa tttcagtgct acgatcagta tctactgaag aatctcagaa 180
aggcagcaga ggcaaggggt caggcttttt gggctagagg tccagataat gcaggttctt 240
ataattcaca gccacaagaa actggtttct tctgtgatgg aggagattac gatggctatt 300
ttggaaggtt cttccttaag tggtactctc aggtgttgat tgatcatggt gatagagtac 360
ttgccttggc 370

<210> 257
<211> 287
<212> DNA
<213> Pinus radiata

<400> 257
ggaaatctta acaaggacat ctactacaga gatcggcatg gatattctag tgatgagtat 60
ctatctgctg gagtggatca aatacctata ttatatggac gtacagctgt tgaatgctat 120
gaagatttca tggtcagctt catagacaaa tttcaatcac tcatgggaaa tccaattcaa 180
gaaattacta ttggccttgg tccgtcaggt gaactaaggt accctgccca tccttttttct 240
gatgggagat ggaagttccc tggtattgga gaattccagt gctatga 287

<210> 258
<211> 396
<212> DNA
<213> Pinus radiata

<400> 258
gcggtatcca tcttatcctg agagtaacgg tacatggaaa ttcccaggga ttggagcatt 60
tcagtgctat gataaggtat ggatactagc catttttttt tatgaatttc cctccagctg 120
tattttagtc atatagttgc cctttttatt tactagtttg gatttccttg tattgcagta 180
tatgatctct aaccttagat ccacgtccga agctgctgga aagcaggagt ggggtaatgg 240
gggtccaagt gatgcaggtc attacaataa ctggcctgag gacagcccgt ttttccgcag 300
agatggtggc tggaacagtt cttatggtga gttttttctt gagtggtatt ctcgtatgct 360
tcttgatcat ggagagagaa tcctaggagc agctga 396

<210> 259
<211> 420
<212> DNA
<213> Pinus radiata

<400> 259
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agatgtttgg tagtgaacag ccagagatat gctgctgcag tccggagggt ctcattaggc 180
agatgagaga agttgcaagg cgaggaaata tacctttaac aggtgaaaat gcaattgaac 240
gctttgataa ggaggctttc tctcaaattg tgagaaatgc ttacaatcgt cctcaggatg 300
tgagagcctt tacgtatttc cgaatgaggg aggcactgtt caggactgat aattggaaat 360

cattcgtgaa ctttgttaag cagatgtaca ataagtctca agatggaggc tgcaatggta 420

<210> 260
<211> 378
<212> DNA
<213> Pinus radiata

<400> 260
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gatacaatat ccgcttctaa cactttaaac cattgcaagg caattcaagc aggcttactt 120
gccttaaagg ctcttggtgt ggatggagtg gttatgcaag tattttgggg cattgtggag 180
agagatgctc caacaaaata tgactggtct gcatatttgg ctttggtgaa aatggtccaa 240
gcagcaggcc tgaaagttca ggcttcaata tgctttaatg gttgtaaatc tagtcaagaa 300
agcttgtcta tacctcttcc atcttgggtt cttacagtgg gcaatagtga tccagacatc 360
ttcttcacag accgatcg 378

<210> 261
<211> 303
<212> DNA
<213> Pinus radiata

<400> 261
gtgataatga tctggcctac acggatcagt ggggcaggcg aaactatgag tatatttcgt 60
tgggatgtga taatctccca gttttgaagg gaagaacgcc tgttcaatgc tatgctgatt 120
acatgaggag tttcaaggag aattttgggg atcttctggg agaaaccatt gtggaaattc 180
aagtgggaat gggtcctgca ggagagctga ggtatccatc ttatcctgag agtaatggta 240
cctggagatt cccaggaatt ggagcatttc agtgctatga taagtatatg gtctctaacc 300
tta 303

<210> 262
<211> 385
<212> DNA
<213> Pinus radiata

<400> 262
cgaaagagat ggatacagac ccatagccag aatgctggca agacatcggg cggtattgaa 60
ttttacatgc attgaaatgc aggataatga acaaccgtcc gaagccagtt gtgggccgga 120
ggctcttgtg cgtcaggtat taaatgctgg atggaaagaa ggtattgagg tttcctgtga 180
aaatgcttta cctagatttg atgaagaagc atatgatcag attgtaaggc aatccagacc 240
cgagggaata aacgaaacag gaccgcccaa gaagcgaata tctgctttta cctatctaag 300
gctatctcaa gaactcatgc aagaacatag ctggaaagaa ttcaacaaat tcctgagaag 360
aatgcatgtg agtttggatt atcat 385

<210> 263
<211> 330
<212> DNA
<213> Pinus radiata

<400> 263
ggcaagatca cctccgctca gtactatgtc aacaacaagg gtgttcccgc cgagaagggc 60
tgccagtggg gtgacggctc cgagcccatc ggtaactggg cccccatgaa cctgggtgtt 120
ggctactctg ccggctccac ctggttgtcc atgttcaaga acgagcctac cacctctgcc 180
aacctggact tcaagatcaa gattatcggt gacgacctga gcgacaactg cagctacgac 240
ggagccggca acttctacaa caaggccggc ctgatcacct ctggcaacgg ctgcactgtc 300
agctcctcct ctggcaacgc ctacttcgtc 330

<210> 264

<211> 359
<212> DNA
<213> Eucalyptus grandis

<400> 264
aatttggaca tcctgaatgg ttggactttc caagggaagg gaacggtttc agttatgata 60
aatgccggcg aagatttgat ctaggagatg ctgagtatct aagataccgg ggaatgcaag 120
aatttgatca ggctatgcag catgttgaag aagcttatgg cttcatgact tctgagcacc 180
aatacatatc cagaaaagat gaaggagaca gggtcatcgt ctttgaaagg ggaaatcttg 240
tgtttgtctt caatttccat tggaataata gctacacgga ctaccatgta ggctgcttga 300
agcctggaaa gntaagattg tcttaaattc agatgacgcc ttgtttggag ggtatagta 359

<210> 265
<211> 451
<212> DNA
<213> Pinus radiata

<400> 265
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aagccaatgc tgtgcctatc caggccatcg aagaacaaac tactaagcca atgcaaaaca 120
gagttgagct tgaagatcgg ccaaaagttg tccctccacc tgggagtggc caaaggattt 180
atgaaataga tccattgttg aataactatc gtgaacatct tgattatcga tttgcgcagt 240
ataagaaaac aagagagttg attgataaat atgaaggtgg cttggaagca ttttctaggg 300
gttatgaaaa gatgggattt aatagaagtg cggctggaat cacatacaga gagtgggcac 360
ctggtgctaa gggggcatca cttataggag atttcaacaa ctggaatccc aatgctgatg 420
ttatgctaag aacgagtttg gagtatggga g 451

<210> 266
<211> 375
<212> DNA
<213> Pinus radiata

<400> 266
gagatttcaa caactggaat cccaatgctg atgttatgac taagaacgag tttggagtat 60
gggagatatt tttaccaaac aatgcagatg gttctccacc aattccccat ggatctcgtg 120
ttaagataca tatggataca atttcgggac caaaggacgc aatccctgct tggattaagt 180
ttgctgttca agctccgggt gagattccat acaatggaat atattatgat ccccctcctg 240
aggataaata tgaatttaag tatcctcgac caaagcagcc caaatcattg cgaatatatg 300
aagcgcatgt tggcatgagc agcacggaac ccaaaattaa tacatatgtt gagttcaggg 360
atgatgtact accac 375

<210> 267
<211> 408
<212> DNA
<213> Pinus radiata

<400> 267
actctgccat gtcatgtttg caatcacctt ctccagttgt tgatcgtggg attgcacttc 60
acaagatgat tcatttcata acaatggcac taggtggcga gggctatctt aattttatgg 120
gaaatgagtt tggtcatccg gaatggattg actttccaag ggaaggaaat ggttggagct 180
atgaaaaatg tagaagacag tggaacttag tggacacaga tcacctgaga tacaagttta 240
tgaataattt tgacaaagcc atgaatgagc ttgatgagaa atttcatttc ctcgcatcgt 300
caaagcaaat agttagcatt gcaaatgaag aagataaggt gattgttttt gaacgaggcg 360
atatagtgtt tgttttcaac ttccatccca agaatacata tcctgggt 408

<210> 268
<211> 476

<212> DNA
<213> Pinus radiata

<400> 268
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agttgggata taatgttatc cagctgatgg cagttatgga acatgcctac tatgcttcct 120
ttggttatca ggtcaccagc tttttcgctg ccagctctcg atatggtact cctgaggagc 180
tcaaggagct gatcgatacc gcgcattcaa tgggcatcac tgtattgctt gatgtagtac 240
actctcacgc ctgcaagaac gtgctcgatg gcttgaacca gttcgatggg actgaccacc 300
agtacttcca tggaggacca aagggatacc acgacttgtg ggacagtcgt ctcttcaact 360
actctcatta tgaggttctc cgcttcctga tgtctaatct gcgcttctgg atggaagagt 420
atcagtttga cggtttccgc tttgatggtg ttacgagtat gttgtatctg catcac 476

<210> 269
<211> 313
<212> DNA
<213> Pinus radiata

<400> 269
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gtctaccacg aatgggcccc gaacgccgta gaggcctccc taatcggaga tttcaacaac 120
tgggaccgac actctcatgc tatgaccaaa gatcagtatg gtgtctgggg aatcacgatc 180
cctagcatca acggacagcc tgctatcccc cacgattcga aaataaaggt ttcgttcgtt 240
attcctggcg gcgagcgtat cgagcgtctg cctgcttgga tcaagcgcgt cacccaggac 300
ctctctgtct cgc 313

<210> 270
<211> 258
<212> DNA
<213> Pinus radiata

<400> 270
aacatctatg atgtacaccc atcacggatt acaggtagca ttcactggga attatgctga 60
gtactttgga tttgctactg atgtagatgc tgtggtttat ttgatgctgg ttaatgacat 120
gattcatggt ctatttcccc aggccataac aattggagaa gatgtgagtg gtatgccaac 180
cttttctcgt tctgtacaag atggcggagt gggatttgat tatcgactcc atatggcagt 240
agctgacaaa tggattga 258

<210> 271
<211> 349
<212> DNA
<213> Pinus radiata

<400> 271
cctatccagg ccttcgaaga acaaactact aagccaatgc aaaacagagt ngagcttgaa 60
gatcggccaa aagttgtccc tccacctggg agtggccaaa ggatttatga aatagatcca 120
ttgttgaata actatcgtga acatcttgat tatcgatttg cgcagtataa gaaaacaaga 180
gagttgattg ataaatatga aggtggcttg gaagcatttt ctaggggtta tgaaaagatg 240
ggatttaata gaagtgcggc tggaatcaca tacagagagt gggcacctgg tgctaagggg 300
gcatcactta taggagattt caacaactgg aatccaatgc tgatgttat 349

<210> 272
<211> 369
<212> DNA
<213> Pinus radiata

<400> 272

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gaatagatca caatgcaagg tttcacacta ctgagggatg gtatgatgat cggccccact 120
cctttcttgt gtatgcacct tgcagaactt cagttgtcta tagtcttaca gatgattaaa 180
tgagaataaa aataagatgt ttgccttgta tccaaatttt accggaaggg aatacatgat 240
cgcaacatgt ttgtatgact gaagaaagca gtatttctaa aacagatatc ggaggacatg 300
gcttctccca ttatcttgtt tttccatata aatctcactt gggcatacca tctttagttc 360
tgtagtcag 369

<210> 273
<211> 327
<212> DNA
<213> Eucalyptus grandis

<400> 273
ctcctttctc tctctacaca tacgctgttt ctctctcttc tcgcctcctt cctccttcga 60
accctccacc tccacccgcg atcccgatgg cttcccgcaa caatggcatc tccggcggca 120
agggcctcat cgtgagcttc ggcgagatgc tcatcgactt cgtcccgacc gtgtcggggg 180
tctccctggc ggaggccccg gggttcctca aggcccccgg cggcgccccc gccaacgtcg 240
cgatcgccgt gacccgcctc ggcggccggt ccgcgttcgt cggcaaagct cggggacgac 300
gagttcgggc aacaatgctg gccggat 327

<210> 274
<211> 275
<212> DNA
<213> Eucalyptus grandis

<400> 274
acattttaaa gcaactatgt tgacattctg gtgtgcggta tgctcacaat gacaagaact 60
gcattagctt ttgttaccaa tagagctgat ggggagcgag agttcctatt ttttcgtcat 120
ccaagtgcgg ccatgctttt acatgaatcg gaaactagat gttgaactta tcagcaaggc 180
aaagatcttc cattatggtt ctatcagttt gattgatgaa ccctgcaaat cggctcatct 240
tgcagcaatg aaaattgcca aaaactcagg gagcg 275

<210> 275
<211> 362
<212> DNA
<213> Eucalyptus grandis

<400> 275
gcaacaatgg catctccggc ggcaagggcc tcatcgtgag cttcggcgag atgctcatcg 60
acttcgtccc gaccgtgtcg gggtctccc tggcggaggc cccggggttc ctccaacgcc 120
cccggcggcg cccccgcaac gtcgcgatcg ccgtgacccg cctcggcggc cggtccgagt 180
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acggggtcaa ctgcgacggc atcaacttcg accagggggc gcggaccgcg ctggccttcg 300
taacgctccg tgccgacggg gagcgcgagt tcatgttcta ccggaacccg agcgccgaca 360
tg 362

<210> 276
<211> 543
<212> DNA
<213> Eucalyptus grandis

<400> 276
gcttagtgtc cccacaagcc caaaaatttt attaggatta tttatatatc ttaagaaagc 60
aaaggagtct gtgacaccat acgcagggga gcaatgggaa tacagaagca gcaggaatgc 120
taaccagact ctcttcaatt gaaaatggaa gcaagcaacg actagtccta agggaaaatc 180
agagaatgga agaattggag cttgttcgaa tgctttattt cgtgccatcg atcaagctga 240

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ggacatcagc ctcggtcggg agggcgggga tcgctccctt cttggtggtg gtgatggctc    300
cgcacgcgtt tgcaaacttc aggactttcc tcaattttcc ttcatcttcg agaatggagc    360
ggtcgtcaan aatgttgcag aggagtgccc cgacaaagga atcaccagcc ccggttgtgt    420
caaccgtgtt aacatggaat gcttcnacat gtccatgaaa atgcttggtg tagtatctac    480
aaccgtgctc acccaaagta acaaggagaa gtgtcaagtt ggggtgccac agtgtcattg    540
cat                                                                  543

<210> 277
<211> 163
<212> DNA
<213> Eucalyptus grandis

<400> 277
agcntttggg acaaggcaga tatcattaaa gtgagtgatg ttgaactgga gttcctcaca     60
gggagtgaca agattgatga tgaaaatgca atgacactgt ggcaccccaa cttgacactt    120
ctccttgtta ctttgggtga gcacggttgt agatactaca cca                     163

<210> 278
<211> 270
<212> DNA
<213> Eucalyptus grandis

<400> 278
cacggttgac acaaccgggg ctggtgattc ctttgtcggg gcactcctct gcaacattgt     60
tgacgaccgc tccattctcg aagatgaagg aaaattgagg aaagtcctga agtttgcaaa    120
cgcgtgcgga ncatcaccac caccaagaag ggagcgatcc ccgccctccc gaccgaggct    180
gatgtcctca gcttgatcga tggcacgaaa taaagcattc gaacaagctc caattcttcc    240
attctctgat tttcccttag gactagtcgt                                     270

<210> 279
<211> 201
<212> DNA
<213> Eucalyptus grandis

<400> 279
cacggttgca cacaaccggg gctggtgatt cctttgtcgg ggcactcctc tgcaacattg     60
ttgacgaccg ctccattctc gaagatgaag gaaaattgag gaaagtcctg aagtttgcaa    120
acgcgtgcgg agccatcacc accaccaaga agggagcgat ccccgccctc ccgaccgagg    180
ctgatgtcct cagcttgatt g                                              201

<210> 280
<211> 319
<212> DNA
<213> Eucalyptus grandis

<400> 280
gcgccgacgg ggagcgcgag ttcatgttct accggaaccc gagcgccgac atgntgctca     60
agcccgagga gctcaacctc gagctgatca gatctgcgaa agtctttcat tatggatcca    120
tcagtttgat tgtggagcca tgcagatccg cccatcttga agcaatgcaa gttgccaagg    180
acgctggggc tctgctctcc tatgatccaa acctcagact accattgtgg ccatcacctg    240
aggaggctcg tgagcagatc aagagcattt ggggacaaag gcagatatca tttaaaagtg    300
gagtgattgt tgaactgga                                                 319

<210> 281
<211> 446
<212> DNA
<213> Eucalyptus grandis
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<400> 281
gcgatcccga tggcttcccg caacaatggc atctccggcg gcaagggcct catcgtgagc 60
ttcggcgaga tgctcattga cttcgtcccg accgtgtcgg gggtctccct ggcggaggcc 120
ccggggttcc tcaaggcccc cggcggcgcc cccgccaacg tcgcgatcgc cgtgacccgc 180
ctcggcggcc ggtccgcgtt cgtcggcaag ctcggggacg acgagttcgg gcacatgctg 240
gccgggatcc tgaaggagaa cggggtcaac tgcgacggca tcaacttcga ccaggggggcg 300
cgtgaccgcg ctggccttcg tcacgctccg cgccgacggg gagcgcgagt tcatgttcta 360
ccggaacccg agcgccgaca tgctgctcaa gcccgaggag ctcaacctcg agctgattan 420
gatctgcgaa agtctttcat tatgga 446

<210> 282
<211> 369
<212> DNA
<213> Eucalyptus grandis

<400> 282
tccaaagaat tcagcacgag cttcgaccag ggggcgcgga ccgcgctggc cttcgtcacg 60
ctccgcgccg acggggagcg cgagttcatg ttctaccgga acccgagcgc cgacatgctg 120
ctcaagcccg aggagctcaa cctcggggct gatcagatct gcgaaagtct ttcattatgg 180
atccatcagt ttgattgtgg agccatgcag atccgcccat cttgaagcaa tgcaagttgc 240
caaggacgct ggggctctgc tctcctatga tttaaacctc agactaccat tgtggccatc 300
acctgaggag gctcgtgagc agatcaagag catttgggac aaggcagata tcattaaagt 360
gagtgatgt 369

<210> 283
<211> 583
<212> DNA
<213> Eucalyptus grandis

<400> 283
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gcttcggcga gatgctcatt gacttcgtcc cgaccgtgtc gggggtctcc ctggcggagg 120
ccccggggtt cctcaaggcc cccggcggcg cccccgccaa cgtcgcgatc gccgtgaccc 180
ggcttggcgg ccggtccgcg ttcgtcggca tgctcgggga cgacgagttc gggcacatgc 240
tggccgggat cctgaaggag aacggggtca actgcgacgg catcaacttc gaccaggggg 300
cgcggaccgc gctggccttc gtcacgctcc gcgccgacgg ggagcgcgag ttcatgttct 360
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gatctgcgaa agtctttcat tatggatcca tcagtttgat tgtggagcca tgcagatccg 480
ccatcttgaa gcaatgcaag ttgccaagga cgctggggct ctgctctcct atgatccaaa 540
cctcagacta ccattgtggg catcacctga ggaggcttcg tga 583

<210> 284
<211> 305
<212> DNA
<213> Eucalyptus grandis

<400> 284
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tccggcggca agggcctcat cgtgagcttc ggcgagatgc tcattgactt cgtcccgacc 120
gtgtcggggg tctccctggc ggaggccccg gggttcctca aggcccccgg cggcgccccc 180
gccaacgtcg cgatcgccgt gacccgcctc ggcggccggt ccgcgttcgt cggcaagctc 240
ggggacgacg agttcgggca catgctggcc gggatcctga aggagaacgg gggtcaactg 300
cgacg 305

<210> 285
<211> 403

<212> DNA
<213> Eucalyptus grandis

<400> 285
tctacacata cgctgtttct ctctcttctc gcctcctctg caaatccatc tccttcctcc 60
ttcgaaccct ccacccgcga tcccgatggc ttcccgcaac aatggcatct ccggcggcaa 120
gggcctcatc gtgagcttcg gcgagatgct cattgacttc gtcccgaccg tgtcgggggt 180
ctccctggcg gaggccccgg ggttcctcaa ggcccccggc ggcgcccccg ccaacgtcgc 240
gatcgccgtg acccgcctcg gcggccggtc cgcgttcgtc ggcaagctcg ggacgacga 300
gttcgggcac atgctggccg ggatcctgaa ggagaacggg gtcaactgcg acggcatcaa 360
cttcgaccag gggcgcgga ccgcgctggc cttcgtcacg ctc 403

<210> 286
<211> 471
<212> DNA
<213> Eucalyptus grandis

<400> 286
gttcctcaag gcccccggcg gcgcccccgc caacgtcgcg atcgccgtga cccgcctcgg 60
cggccggtcc gcgttcgtcg gcaagctcgg ggacgacgag ttcgggcaca tgctggccgg 120
gatcctgaag gagaacgggg tcaactgcga cggcatcaac ttcgaccagg ggcgcggac 180
cgcgctggcc ttcgtcacgc tccgcgccga cggggagcgc gagttcatgt tctaccggaa 240
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gaaagtcttt cattatggat ccatcagttt gattgtggag ccatgcagat ccgcccatct 360
tgaagcaatg caagttgcca aggacgctgg ggctctgctc tcctatgatc caaacctcag 420
actaccattg tggccatcac ctgaggaggt tcgtgagcag atcaagagca t 471

<210> 287
<211> 410
<212> DNA
<213> Eucalyptus grandis

<400> 287
tctctctcta cacatacgct gtttctctct ctcctcgcct ccttcctcct tcgaaccctc 60
cacctccacc ggcgatcccg atggcttccc gcaacaatgg catctccggc ggcaagggcc 120
tcatcgtgag cttcggcgag atgctcatcg acttcgtccc gaccgtgtcg gggggtctccc 180
tggcggaggc cccggggttc ctcaaggccc ccggcggcgc ccccgccaac gtcgcgatcg 240
ccgtgacccg cctcggcggc cggtccgcgt tcgtcggcaa gctcggggac gacgagttcg 300
ggcacatgct ggccgggatc ctgaaggaga acggggtcaa ctgcgacggc atcaacttcg 360
accagggggc gcggaccgcg ctggccttcg tcacgctccg cgccgacggg 410

<210> 288
<211> 451
<212> DNA
<213> Eucalyptus grandis

<400> 288
cgagttcggg cacatgctgg ccgggatcct gaaggagaac ggggtcaact gcgacggcat 60
caacttcgac caggggggcgc ggaccgcgct ggccttcgtc acgctccgcg ccgacgggga 120
gcgcgagttc atgttctacc ggaacccgag cgccgacatg ctgctcaagc ccgaggagct 180
caacctcgag ctgatcagat ctgcgaaagt ctttcattat ggatccatca gtttgattgt 240
ggagccatgc agatccgccc atcttgaagc aatgcaagtt gcaaggacgc tggggctctg 300
ctctcctatg atccaaacct cagactacca ttgtggccat cacctgagga ggctcgtgag 360
cagatcaaga gcatttggga caaggcagat atcattaaag tgagtgatgt tgaactggag 420
ttcctcacag ggagtgacaa gattgatgat g 451

<210> 289

<211> 361
<212> DNA
<213> Eucalyptus grandis

<400> 289
ccatgttaac acggttgaca caaccggggc tggtgattcc tttgtcgggg cactcctctg 60
caacattgtt gacgaccgct ccattctcga agatgaagga aaattgagga aagtcctgaa 120
gtttgcaaac gcgtgcggag ccatcaccac caccaagaag ggagcgatcc ctgccctccc 180
gaccgaggct gatgtcctca gcttgatcga tggcacgaaa taaagcattc gaacaagctc 240
caattcttcc attctctgat tttcccctag gactagtcgt tgcttgcttc cattttcaat 300
tgaagagagt ctggttagca ttcctgctgc ttctgtattc ccattgctcc cctgcgtatg 360
g 361

<210> 290
<211> 347
<212> DNA
<213> Eucalyptus grandis

<400> 290
gcggcaaggg cctcatcgcg agctcnagcg agatgctgat tgactntgac ccgaccgtgt 60
cggtggtctg cctggcggag gccccggggt tcctcacggc cccccggcggg gcccccgcca 120
acgtggcgat cgccgagacc cggctggggg gccggtccac gttcgtcggg aagctcgggg 180
acgacgagtt canccacatg ctggccggga tcctgaagga gaacggggtc aactgcgacg 240
gcatcaacta cnaccagagg gcgcggaccg agctgacctt caacacgctc cacgcccact 300
ggaagcgcta gttcntgttc taccggaacc cgagcgccta catgctg 347

<210> 291
<211> 335
<212> DNA
<213> Eucalyptus grandis

<400> 291
ccacccgcga tcccgatggc ttcccgcaac aatggcatct ccggcggcaa gggcctcatc 60
gtgagcttcg gcgagatgct cattgacttc gtcccgaccg tgtcgggggt ctccctggcg 120
gaggccccgg ggttcctcaa ggcccccggc ggcgcccccg ccaacgtcgc gatcgccgtg 180
acccgcctcg gcggccggtc cgcgttcgtc ggcaagctcg gggacgacga gttcgggcac 240
atgctggccg ggatcctgaa ggagaacggg gtcaactgcg acggcatcaa cttcgaccag 300
ggggcgcgga ccgcgctggc cttcgtcacg ctccg 335

<210> 292
<211> 643
<212> DNA
<213> Eucalyptus grandis

<400> 292
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gttcgtcggc aagctcgggg acgacgagtt cgggcacatg ctggccggga tcctgaagga 120
gaacggggtc aactgcgacg gcatcaactt cgaccagggg gcgcggaccg cgctggcctt 180
cgtcacgctc cgcgccgacg gggagcgcga gttcatgttc taccggaacc cgagcgccga 240
catgctgctc aagcccgagg agctcaacct cgagctgatc agatctgcga aagtctttca 300
ttatggatcc atcagtttga ttgtggagcc atgcagatcc gcccatcttg aagcaatgca 360
agttgccaag gacgctgggg ctctgctctc ctatgatcca aacctcagac taccattgtg 420
gccatcacct gaggaggctc gtgagcagat caagagcatt tgggacaagg cagatatcat 480
taaagtgagt gatgttgaac tggagttcct cacagggagt gacaagattg atgatgaaaa 540
tgcaatgaca ctgtggcacc ccaacttgac acttctnctt gttactttgg gtgaacacgg 600
tgtagatact acaccaagca ttttcatgga catgtggaag cat 643

<210> 293
<211> 300
<212> DNA
<213> Eucalyptus grandis

<400> 293
ccacccgcga tcccgatggc ttcccgcaac aatggcatct ccggcggcaa gggcctcatc 60
gtgagcttcg gcgagatgct cattgacttc gtcccgaccg tgtcgggggt ctccctggcg 120
gaggccccgg ggttcctcaa ggcccccggc ggcgcccccg ccaacgtcgc gatcgccgtg 180
acccgcctcg gcggccggtc cgcgttcgtc ggcaagctcg ggacgacga gttcgggcac 240
atgctggccg ggatcctgaa ggagaacggg gtcaactgcg acggcatcaa cttcgaccag 300

<210> 294
<211> 329
<212> DNA
<213> Pinus radiata

<400> 294
cagagcttgc atgtggatct catcagagag gaaaaaattt tccactatgg ttcaataagc 60
cttatttcag atccttgcaa atcagcacat ttggctgcaa tcaagatagc aaaagatgct 120
ggtgttattc tttcatatga tcctaatttg aggctgccgt tatggccatc agaagatgca 180
gcccgggcgg gtattttgag catttgggat tctgcagacg ttataaagct aagtgagcaa 240
gagattgtat ttttaactga aggtgccgaa tccttgtgat gaatgctgtt gtacgtaaac 300
tttttcaccc aaatctcaag ctattgctg 329

<210> 295
<211> 496
<212> DNA
<213> Pinus radiata

<400> 295
gtcgttgctt cttactgcat tgagtcattg gaaaatggtt tcagaaaggc tctcaatttg 60
gaaaagcctg agaagagctt gatcgtttgc tttggggaga tgctcattga ttttgtcccc 120
acggtctcgg atgtttcgct ggctgaagcg cccggattcc aaaaggctgc aggtggtgca 180
cctgctaatg tggctgttgg aatttccagg ctcggtggcc gatccgcatt tgttggcaag 240
gttggggatg atgagtttgg gcgcatgctt gctgacattc tgagggaaaa caatgtgatg 300
gaccgaggaa ttagatttga ttcccatgcc agaaccgcgc tggcattcgt tactttaaag 360
atgaatggcg agagggaatt tatgttctat cgtaatccca gcgctgacat gcttctcaag 420
gaatctgagc ttgatgcaga gctgatccga gaggcatcga tatttcacta tggatcaatc 480
agtctgattg cagagc 496

<210> 296
<211> 473
<212> DNA
<213> Pinus radiata

<400> 296
gagcagctga caggtgaatc accacttgtg gtttgctttg gagaaatgct gattgatttc 60
gtcccaacag ttgccggatt gtcattatct gaagcgcagg ccttcaaaaa ggctcctgga 120
ggtgcacctg ctaatgttgc tgtttgcata gcaagactag gaggttcatc agcatttatt 180
ggaaaggttg gtgatgacga gtttggatat atgcttgctg atatcttgga gaaaaacaat 240
gtaaataata agggcatgcg ttttgatgct ggagctcgaa ctgctttggc atttgtgaca 300
ttaaggagtg atggtgaacg tgaatttatg ttttacagaa atccaagtgc agatatgtta 360
ctcgacgaat cagagcttga tgtggatctc atcagagagg caaaaatttt ccactatggt 420
tcaataagcc ttatttcaga tccttgcaaa tcagcacatt tggctgcaat caa 473

<210> 297

<211> 369
<212> DNA
<213> Pinus radiata

<400> 297
cagcagacag gtgaatcacc acttgtggtt tgctttggag aaatgctgat tgatttcgtc 60
ccaacagttg ccggattgtc attatctgaa gcgcaggcct tcaaaaaggc tcctggaggt 120
gcacctgcta atgttgctgt ttgcatagca agactaggag gttcatcagc atttattgga 180
aaggttggtg atgacgagtt tggatatatg cttgctgata tcttggagaa aaacaatgta 240
aataataagg gcatgcgttt tgatgctgga gctcgaactg ctttggcatt tgtgacatta 300
aggagtgatg gtgaacgtga atttatgttt tacagaaatc caagtgcaga tatgttactc 360
gacgaatca 369

<210> 298
<211> 459
<212> DNA
<213> Pinus radiata

<400> 298
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gtcccaacag ttgccggatt gtcattatct gaagcgcagg ccttcaaaaa ggctcctgga 120
ggtgcacctg ctaatgttgc tgtttgcata gcaagactag gaggttcatc agcatttatt 180
ggaaaggttg gtgatgacga gtttggatat atgcttgctg atatcttgga gaaaaacaat 240
gtaaataata agggcatgcg ttttgatgct ggagctcgaa ctgctttggc atttgtgaca 300
ttaaggagtg atggtgaacg tgaatttatg ttttacagaa atccaagtgc agatatgtta 360
ctcgacgaat cagagcttga tgtggatctc atcagagagg caaaaatttt ccactatggt 420
tcaataagcc ttatttcaga tccttgcaaa tcagcacat 459

<210> 299
<211> 417
<212> DNA
<213> Pinus radiata

<400> 299
gttctgactc agattgcaag tgacatgtct attcttgagg atgaacacct cccacaaatg 60
catctcctgc acctgttgta tcaattgcag tcactgataa tgtatctacc tttccgcgaa 120
aagactttgt atagtatcgg cagcctttgg gtccatcagt tactagaagt aattttaatt 180
tggaatgcca gagtgacatc accacttcgt cattatcaga gtctcctccc gtcaggaatg 240
ccacctcttc atcacttatc tttatcaaat ccgcttcctc ccaaatgctg agaatgcctt 300
tgcgctggtg ccgaattcgg cacgaggcag agcgggtgaa ttttctgttt gggggtagga 360
aatggaaaaa acttggagga catggaggaa aactctttaa gattcctgaa gcactca 417

<210> 300
<211> 359
<212> DNA
<213> Pinus radiata

<400> 300
gtccgtgatc agactaattg atccataatg gaaaatttta gcctgttgga ttaagtccac 60
gtcaagctca gattcagtta gtagcatatc agcactggga ttccggaaaa acataaactc 120
tcgttcacca tcggctttca atgtgacaaa agccaaagca gttcgagcac caagatcaaa 180
gcgcatccct ttgtgctcca cattattttc tttcagaata tccacaagca tgcgcccaaa 240
ttcatcctcg ccaaccttcc ctataaatgc ggatgaacct ccgagccttg ctataccaac 300
ggcaacattc gcaggggctc cccctggagc tttcttgaat gcaggagcat cagccaatg 359

<210> 301
<211> 374

<212> DNA
<213> Pinus radiata

<400> 301
gtccgtgatc agactaattg atccataatg gaaaatttta gcctgttgga ttaagtccac 60
gtcaagctca gattcagtta gtagcatatc agcactggga ttccggaaaa acataaactc 120
tcgttcacca tcggctttca atgtgacaaa agccaaagca gttcgagcac caagatcaaa 180
gcgcatccct ttgtgctcca cattattttc tttcagaata tccacaagca tgcgcccaaa 240
ttcatcctcg ccaaccttcc ctataaatgc ggatgaacct ccgagccttg ctataccaac 300
ggcaacattc gcaggggctc cccctggagc tttcttgaat gcaggagcat cagccaatga 360
cactccattg accg 374

<210> 302
<211> 339
<212> DNA
<213> Pinus radiata

<400> 302
gtccatcagt tactagaagt aattttaatt tggaatgcca gagtgacatc accacttcgt 60
cattatcaga gtctcctccc gtcaggaatg ccacctcttc atcacttatc tttatcaaat 120
ccgcttcctc ccaaatgctg agaatgcctt tgcgagcctc atcatcagat ggccaaagag 180
gcaatctcac attcgggtca taggagagca gggcacctcc ttttctcgca attttcatgg 240
ctgcaagatg agctgaccta gttggctctg caatcagact gattgatcca tagtgaaata 300
tcgatgcctc tcggatcagc tctgcatcaa gctcagatt 339

<210> 303
<211> 402
<212> DNA
<213> Pinus radiata

<400> 303
gtccatcagt tactagaagt aattttaatt tggaatgcca gagtgacatc accacttcgt 60
cattatcaga gtctcctccc gtcaggaatg ccacctcttc atcacttatc tttatcaaat 120
ccgcttcctc ccaaatgctg agaatgcctt tgcgagcctc atcatcagat ggccaaagag 180
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ctgcaagatg agctgaccta gttggctctg caatcagact gattgatcca tagtgaaata 300
tcgatgcctc tcggatcagc tctgcatcaa gctcagattc cttgagaagc atgtcagcgc 360
tgggattacg atagaacata aattccctct cgccattcat ct 402

<210> 304
<211> 468
<212> DNA
<213> Pinus radiata

<400> 304
gcgaatgttg ccgttggtat agcaaggctc ggaggttcat ccgcatttat agggaaggtt 60
ggcgaggatg aatttgggcg catgcttgtg gatattctga aagaaaataa tgtggagcac 120
aaagggatgc gctttgatct tggtgctcga actgctttgg cttttgtcac attgaaagcc 180
gatggtgaac gagagtttat gtttttccgg aatcccagtg ctgatatgct actaactgaa 240
tctgagcttg acgtggactt aatccaacag gctaaaattt tccattatgg atcaattagt 300
ctgatcacgg acccctgtaa gtctgcgcat ttggctgcca tgaaaatcgc tagagacacg 360
ggcagtatac tgtcttatga tcccaatctc agattgccat tatggccatc agcgagcgaa 420
gctcgggagg gtattttaag catatgggat aaagcagatt taattaag 468

<210> 305
<211> 502
<212> DNA

<213> Pinus radiata

<400> 305
gcgaatgttg ccgttggtat agcaaggctc ggaggttcat ccgcatttat agggaaggtt 60
ggcgaggatg aatttgggcg catgcttgtg gatattctga aagaaaataa tgtggagcac 120
aaagggatgc gctttgatct tggtgctcga actgctttgg cttttgtcac attgaaagcc 180
gatggtgaac gagagtttat gtttttccgg aatcccagtg ctgatatgct actaactgaa 240
tctgagcttg acgtggactt aatccaacag gctaaaattt tccattatgg atcaattagt 300
ctgatcacgg acccctgtaa gtctgcgcat ttggctgcca tgaaaatcgc tagagacacg 360
ggcagtatac tgtcttatga tcccaatctc agattgccat tatggccatc agcgagcgaa 420
gctcgggagg gtattttaag catatgggat aaagcagatt taattaaggt tagtgaagag 480
gaagtaggat ttttaacagg ag 502

<210> 306
<211> 379
<212> DNA
<213> Pinus radiata

<400> 306
gaactgcttt ggcatttgtg acattaagga gtgatggtga acgtgaattt atgttttaca 60
gaaatccaag tgcagatatg ttactcgacg aatcagagct tgatgtggat ctcatcagag 120
aggcaaaaat tttccactat ggttcaataa gccttatttc agatccttgc aaatcagcac 180
atttggctgc aatcaagata gcaaaagatg ctggtgttat tctttcatat gatcctaatt 240
tgaggctgcc gttatggcca tcagaagatg cagcccgggc gggtattttg agcatttggg 300
attctgcaga cgttataaag ctaagtgagc aagagattgt atttttaact gaaggtgaag 360
atccttgtga tgatgctgt 379

<210> 307
<211> 233
<212> DNA
<213> Pinus radiata

<400> 307
agtttatgtt tttccggaat cccagtgctg atatgctact aactgaatct gagcttgacg 60
tggacttaat ccaacaggct aaaattttcc attatggatc aattagtctg atcacggacc 120
cctgtaagtc tgcgcatttg gctgccatga aaatcgctag agacacgggc agtatactgt 180
cttatgatcc caatctcaga ttgccattat ggccatcagc gagccgaagc tcg 233

<210> 308
<211> 377
<212> DNA
<213> Pinus radiata

<400> 308
gaaagctcca gggggagccc ctgcgaatgt tgccgttggt atagcaaggc tcggaggttc 60
atccgcattt atagggaagg ttggcgagga tgaatttggg cgcatgcttg tggatattct 120
gaaagaaaat aatgtggagc acaaagggat gcgctttgat cttggtgctc gaactgcttt 180
ggcttttgtc acattgaaag ccgatggtga acgagagttt atgtttttcc ggaatcccag 240
tgctgatatg ctactaactg aatctgagct tgaccgtgga cttaatccaa caggctaaaa 300
ttttccatta tggatcaatt aatctgatca cggacccctg taagtctgcg catttggctg 360
ccatgaaaat cgctaga 377

<210> 309
<211> 517
<212> DNA
<213> Pinus radiata

<400> 309
gtcccaacag ttgccggatt gtcattatct gaagcgcagg ccttcaaaaa ggctcctgga 60
ggtgcacctg ctaatgttgc tgtttgcata gcaagactag gaggttcatc agcatttatt 120
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gtaaataata agggcatgcg ttttgatgct ggagctcgaa ctgctttggc atttgtgaca 240
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tcaataagcc ttatttcaaa tccttgcaaa tcagcacatt tggctgcaat caagatagca 420
aaagatgctg gtgttattct ttcatatgat cctaatttga gctgccgtat ggcatcaaaa 480
gatgcacccg ggcggtattt ttgactttgg gattctt 517

<210> 310
<211> 360
<212> DNA
<213> Pinus radiata

<400> 310
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ggatgtagat attacaccaa ggattttagc ggaagagtga aaggcctggc agtggaagct 120
gtagacacca ctggtgctgg agatgcgttt gtgagtggaa ttcttagtca attggctaag 180
gacctcactt tattgcagaa gagagcctga gagaggcatt gaagtttgca aatgcctgtg 240
gtgcaattac ggttactgag aggggggcaa tccctgctct tcccacacga gaagcagtgc 300
tagcagctct gacaaaagtt cttgcctgag ctttttatct acatttcttt ttttgcatag 360

<210> 311
<211> 438
<212> DNA
<213> Pinus radiata

<400> 311
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tctgaggtgt ccccgctagt ggtgtgcttt ggggaattgc tgatcgattt tgtcccaacg 120
gtcaatggag tgtcattggc tgatgctcct gcattcaaga aagctccagg gggagcccct 180
gcgaatgttg ccgttggtat agcaaggctc ggaggttcat ccgcatttat agggaaggtt 240
ggcgaggatg aatttgggcg catgcttgtg gatattctga aagaaaataa tgtggagcac 300
aaagggatgc gctttgatct tggtgctcga actgctttgg cttttgtcac attgaaagcc 360
gatggtgaac gagaagttta tgtttttccg gaatcccagt gctgatatgc tactaactga 420
atctgacttg acgtggac 438

<210> 312
<211> 294
<212> DNA
<213> Pinus radiata

<400> 312
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agcttgatgt ggatctcatc agagaggcaa aaatttccca ctatggttca ataagcctta 120
tttcagatcc ttgcaaatca gcacatttgg ctgcaatcaa gatagcaaaa gatgctggtg 180
ttattctttc atatgatcct aatttgaggc tgccgttatg gccatcagaa gatgcagccc 240
gggcgggtat tttgagcatt tgggattctg cagacgttat aaagctaagt gagc 294

<210> 313
<211> 510
<212> DNA
<213> Pinus radiata

<400> 313

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cattgagtga agacgacaat aatgggaaac catctgaggt gtccccgcta gtggtgtgct 120
ttggggaatt gctgatcgat tttgtcccaa cggtcaatgg agtgtcattg gctgatgctc 180
ctgcattcaa gaaagctcca gggggagccc ctgcgaatgt tgccgttggt atagcaaggc 240
tcggaggttc atccgcattt atagggaagg ttggcgagga tgaatttggg cgcatgcttg 300
tggatattct gaaagaaaat aatgtggagc acaaagggat gcgctttgat cttggtgctc 360
gaactgcttt ggcttttgtc acattgaaag ccgatggtga acgagagttt atgtttttcc 420
ggaatcccag tgctgatatg ctactaactg aatctgagct tgacgtggac ttaatccaac 480
aggctaaaat tttccattat ggatcaatta 510

<210> 314
<211> 487
<212> DNA
<213> Pinus radiata

<400> 314
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tcagttagat tgtaagtttg cggccatggc tatgcgcgtt ccggcaaatt ccattgctcc 120
attcgacaat aatgtcgaga aatctgcacc cccgctgacg aattcgagca catcgtcatt 180
cgtcgcatcg ggccgcctcg cgaaggttaa tcgatcggct tcgttgtcgc tcactattcg 240
gcaacggagg tctcaaggtt ctgcaagagc atcagtagca gacaacaaag agcagctgac 300
aggtgaatca ccacttgtgg tttgctttgg agaaatgctg attgatttcg tcccaacagt 360
tgccggattg tcattatctg aagcgcaggc cttcaaaaag gctcctggag gtgcacctgc 420
taatgttgct gtttgcatag caagactagg agggtcatcn gcntttattg gaaaggttgg 480
tgatgac 487

<210> 314
<211> 421
<212> DNA
<213> Pinus radiata

<400> 315
cttcaggttt aatagtgaaa gcattgagtg aagacgacaa taatgggaaa ccatctgagg 60
tgtccccgct agtggtgtgc tttggggaat tgctgatcga ttttgtccca acggtcaatg 120
gagtgtcatt ggctgatgct cctgcattca agaaagctcc agggggagcc cctgcgaatg 180
ttgccgttgg tatagcaagg ctcggaggtt catccgcatt tatagggaag gttggcgagg 240
atgaatttgg gcgcatgctt gtggatattc tgaaagaaaa taatgtggag cacaaaggga 300
tgcgctttga tcttggtgct cgaactgctt tggcttttgt cacattgaaa gccgatggtg 360
aacgagagtt tatgtttttc cggaatccca gtgctgatat gctactaact gaatctgagc 420
t 421

<210> 316
<211> 420
<212> DNA
<213> Pinus radiata

<400> 316
ggacccctgt aagtctgcgc atttggctgc catgaaaatc gctagagaca cgggcagtat 60
actgtcttat gatcccaatc tcagattgcc attatggcca tcagcgagcg aagctcggga 120
gggtatttta agcatatggg ataaagcaga tttaattaag gttagtgaag aggaagtagg 180
atttttaaca ggaggtgcag atccattcga cgacactgtt gtacgcaacc ttttccatcc 240
aaacctcaaa ttgcttctcg tgactgaagg ccagcaagga tgtagatatt acaccaagga 300
ttttagcgga agagtgaaag gcctggcagt ggaagctgta gacaccactg gtgctggaga 360
tgcgtttgtg agtggaattc ttagtcaatt ggctaaggac ctcactttat tgcagaaaga 420

<210> 317
<211> 499

<212> DNA
<213> Pinus radiata

<400> 317
ctgcactgag tcattggaaa atggtttcag aaaggctctc aatttggaaa agcctgagaa 60
gagcttgatc gtttgctttg gggagatgct cattgatttt gtccccacgg tctcggatgt 120
ttcgttggct gaagcgcccg gattccaaaa ggctgcaggt ggtgcacctg ctaatgtggc 180
tgttggaatt tccaggctcg gtggccgatc cgcatttgtt ggcaaggttg gggatgatga 240
gtttgggcgc atgcttgctg acattctgag ggaaaacaat gtgatggacc gaggaattag 300
atttgattcc catgccagaa ccgcgctggc attcgttact ttaaagatga atggcgagag 360
ggaatttatg ttctatcgta atcccagcgc tgacatgctt ctcaaggaat ctgagcttga 420
tgcaaagctg atcccagagg catcgatatt tcattatgga tcaatcagtc tgattgcaga 480
gcccactagg tcagctcat 499

<210> 318
<211> 364
<212> DNA
<213> Pinus radiata

<400> 318
gcgaagctcg ggagggtatt ttaagcatat gggataaagc agatttaatt aaggttagtg 60
aagaggaagt aggattttta acaggaggtg cagatccatt cgacgacact gttgtacgca 120
acctttccca tccaaacctc aaattgcttc tcgtgactga aggccagcaa ggatgtagat 180
attacaccaa ggattttagc ggaagagtga aaggcctggc agtggaagct gtaaacacca 240
ctggtgctgg agatgcgttt gtgagtggaa ttcttagtca attggctaag gacctcactt 300
tattgcagaa agaagagggc ctgagagagg cattgaagtt tgcaaatgcc tgtggtgcaa 360
ttac 364

<210> 319
<211> 298
<212> DNA
<213> Eucalyptus grandis

<400> 319
aagcgattcg tttcttcgag ctcaacaccg gggccaagat cccctccgtc gggctgggca 60
cttggcagac cggtgacggc gtcgacgccg tcaccaccgc catcaaggtt gggtacaggc 120
atattgattg tgctcaagct tatcaaaatg agaaggagat tggtactgct ctccagaaat 180
tattcagcga gggtgtggtg aagcgcgagg atttgtggat cacatccaag ctatggtgtg 240
ctgatcacgc accagaaaga tgttcccaag gcatttagaa agaaccctgg agaaactt 298

<210> 320
<211> 261
<212> DNA
<213> Eucalyptus grandis

<400> 320
gttttcgaga gagaaatggc gaaggcgatt cgtttcttcg agctcaacac cggggccaag 60
atcccctccg tcgggctggg cacttggcag accggtgacg gcgtcgacgc cgtcaccacc 120
gccatcaagg ttgggtacag gcatattgat tgtgctcaag cttatcaaaa tgagaaggag 180
attggtactg ctctccagaa attattcagc gagggtgtgg tgaagcgcga ggatttgtgg 240
atcacatcca agctatggtg t 261

<210> 321
<211> 450
<212> DNA
<213> Eucalyptus grandis

<400> 321
ctagggtgag atcgaagctc gcgttttcga gagagaaatg gcgaaggcga ttcgtttctt 60
cgagctcaac accggggcca agatcccctc cgtcgggctg ggcacttggc agaccggtga 120
cggcgtcgac gccgtcacca ccgccatcaa ggttgggtac aggcatattg attgtgctca 180
agcttatcaa aatgagaagg agattggtac tgctctccag aaattattca gcgagggtgt 240
ggtgaagcgc gaggatttgt ggatcacatc caagctatgg tgtgctgatc acgcaccaga 300
agatgttccc aaggcattag aaagaaccct ggagaacttg cagctcgagt atctggatct 360
ttacctgatc cactggccgg tgagcatgag gaaggctcaa tttggcttca agcctgaaaa 420
ccttacccag ccggacatac ccagtacgtg 450

<210> 322
<211> 347
<212> DNA
<213> Eucalyptus grandis

<400> 322
cgagagagaa atggcgaagg cgattcgttt cttcgagctc aacaccgggg ccaagatccc 60
ctccgtcggg ctgggcactt ggcagaccgg tgacggcgtc gacgccgtca ccaccgccat 120
caaggttggg tacaggcata ttgattgtgc tcaagcttat caaaatgaga aggagattgg 180
tactgctctc cagaaattat tcagcgaggg tgtggtgaag cgcgaggatt tgtggatcac 240
atccaagcta tggtgtgctg atcacgcacc agaagatgtt cccaaggcat tagaaagaac 300
cctggagaac ttgcagctcg agtatctgga tctttacctg atccact 347

<210> 323
<211> 414
<212> DNA
<213> Eucalyptus grandis

<400> 323
cacgagtcgg ctggcgaagt agtcgaagta ggtgaaggcg taacccaatg gaaagtcggc 60
gaccgagtcg ctatcgaggc tggagtacct tgttcccaac ctgcttgcga tgcgtgtcgt 120
actggccgat acaacgcatg cccagatgtc gttttcttct caaccccgcc gttccatggc 180
acattgacgc gctggcacct tcatccggca cagtggttgc accgtcttcc ggataatgtt 240
tctttcgaag agggcgcctt gtgcgaacca ctcgctgtcg cattggccgg catcgagcgt 300
tccggtctca gactcggaga tcccgtcctt gtctgtggtg ctggaccaat aggcctaatc 360
tctctacttt cggcccgtgc tgcgggtgca gagcctattg ttataacgga cctt 414

<210> 324
<211> 464
<212> DNA
<213> Eucalyptus grandis

<400> 324
cacgagtcgg ctggcgaagt agtcgaagta ggtgaaggcg taacccaatg gaaagtcggc 60
gaccgagtcg ctatcgaggc tggagtacct tgttcccaac ctgcttgcga tgcgtgtcgt 120
actggccgat acaacgcatg cccagatgtc gttttcttct caaccccgcc gttccatggc 180
acattgacgc gctggcacct tcatccggca cagtggttgc accgtcttcc ggataatgtt 240
tctttcgaag agggcgcctt gtgcgaacca ctcgctgtcg cattggccgg catcgagcgt 300
tccggtctca gactcggaga tcccgtcctt gtctgtggtg ctggaccaat aggcctaatc 360
tctctacttt cggcccgtgc tgcgggtgca gagcctattg ttataacgga ccttttccaa 420
agccgtctgg actttgcgaa gaagctggtg cctggcgttc gcac 464

<210> 325
<211> 368
<212> DNA
<213> Eucalyptus grandis

<400> 325
cacgagtcgg ctggcgaagt agtcgaagta ggtgaaggcg taacccaatg gaaagtcggc 60
gaccgagtcg ctatcgaggc tggagtacct tgttcccaac ctgcttgcga tgcgtgtcgt 120
actggccgat acaacgcatg cccagatgtc gttttcttct caaccccgcc gttccatggc 180
acattgacgc gctggcacct tcatccggca cagtggttgc accgtcttcc ggataatgtt 240
tctttcgaag agggcgcctt gtgcgaacca ctcgctgtcg cattggccgg catcgagcgt 300
tccggtctca gactcggaga tcccgtcctt gtctgtggtg ctggaccaat aggcctaatc 360
tctctact 368

<210> 326
<211> 350
<212> DNA
<213> Eucalyptus grandis

<400> 326
ctagggtgag atcgaagctc gcgttttcga gagagaaatg gcgaaggcga ttcgtttctt 60
cgagctcaac accggggcca agatcccctc cgtcgggctg ggcacttggc agaccggtga 120
cggcgtcgac gccgtcacca ccgccatcaa ggttgggtac aggcatattg attgtgctca 180
agcttatcaa aatgagaagg agattggtac tgctctccag aaattattca gcgagggtgt 240
ggtgaagcgc gaggatttgt ggatcacatc caagctatgg tgtgctgatc acgcaccaga 300
agatgttccc aaggcattag aaagaaccct ggagaacttg cagctcgagt 350

<210> 327
<211> 372
<212> DNA
<213> Eucalyptus grandis

<400> 327
cttcgagctc aacaccgggg ccaagatccc ctccgtcggg ctgggcactt ggcagaccgg 60
tgacggcgtc gacgccgtca ccaccgccat caaggttggg tacaggcata ttgattgtgc 120
tcaagcttat caaaatgaga aggagattgg tactgctctc cagaaattat tcagcgaggg 180
tgtggtgaag cgcgaggatt tgtggatcac atccaagcta tggtgtgctg atcacgcacc 240
agaagatgtt cccaaggcat tagaaagaac cctggagaac ttgcagctcg agtatctgga 300
tctttacctg atccactggc cggtgagcat gaggaagggc tcaattggct tcaagcctga 360
aaaccttacc ca 372

<210> 328
<211> 333
<212> DNA
<213> Eucalyptus grandis

<400> 328
aaatggcgaa ggcgattcgt ttcttcgagc tcaacaccgg ggccaagatc ccctccgtcg 60
ggctgggcac ttggcagacc ggtgacggcg tcgacgccgt caccaccgcc atcaaggttg 120
ggtacaggca tattgattgt gctcaagctt atcaaaatga gaaggagatt ggtactgctc 180
tccagaaatt attcagcgag ggtgtggtga agcgcgagga tttgtggatc acatccaagc 240
tatggtgtgc tgatcacgca ccagaagatg ttcccaaggc attagaaaga accctggaga 300
acttgcagct cgagtatctg gatctttacc tga 333

<210> 329
<211> 377
<212> DNA
<213> Eucalyptus grandis

<400> 329
cgcactcctt ttgcctgccc cccacgagcc cggagcggga gtagactgag atcgaagctc 60
gcgttttcga gagagaaatg gcgaaggcga ttcgtttctt cgagctcaac acgggggcca 120

agatcccctc catcgggctg ggcacttggc aggccgatcc cggcgtcgtg gccgaggccg 180
tcaccaccgc cacaaaggct gggtacaggc atattgattg tgctcaagct tattacaatg 240
agaaggagat tggtactgct ctccagaaat tattcagcga gggtgtggtg aagcgcgagg 300
atttgtggat cacttccaag ctatggtgta ctgatcacgc accggaagat gttcccaagg 360
caatagacag aaccttg 377

<210> 330
<211> 484
<212> DNA
<213> Eucalyptus grandis

<400> 330
aactaatggt tcgcttgcca ataaggtggt gcatcctgca catctgtgtt acaagctacc 60
ggaaaatgtg agcttggagg aaggagcaat gtgtgaaccc ctcagtgttg gtgtacacgc 120
ttgtcgccga gcaaatatca atcctgagac caacatactc ataataggat cagggccgat 180
tggccttgtt accttattag cagcccgtgc ttttggagct ccgagaatcg tcatcactga 240
tgtagacgag tgcagattat cgattgcgaa aatgcttggt gcctctgagg tggttcaagt 300
ctcaacagat gttcagctag tggatgaaga agtggcgcgc atccaaaatg caatgggctg 360
cgacattgat gtgagcttcg attgtgttgg ctatgacaag acaatgacca cagctttgaa 420
tgcgactcgt gctggtggca aagtgtgcct catcggacta gccttgagca agatgacagt 480
tcct 484

<210> 331
<211> 477
<212> DNA
<213> Pinus radiata

<400> 331
ccaaagggaa aaaaaatggg gaagggagca atgtctcagg gtaacgaaaa tggggaaggt 60
gacaatatgg ctgcatggct cactggaata aacactcttc gcatccagcc cttcaaactt 120
ccgcctcttg gcccccatga tgcgaaggtg cgcatgaagg ctgtgggtat ctgtggcagt 180
gacgtccact atttgaggac attacggtgt gcggacttta ttgtaaaaga gccaatggtg 240
attggtcatg agtctgctgg aataattgag gaggttggca gtgaagtgaa acatctggtt 300
cctggtgacc gcgtactttg gagcctggaa tatcgtgttg gcgttgtgac caatgtaagc 360
gaggctccta caatttgtgt cccgagatga agtttttttgc aacacctccc gtgcatggtt 420
ccttggccaa tcagattgtt catcctgcag atttatgttt caagttgcca gataatg 477

<210> 332
<211> 433
<212> DNA
<213> Pinus radiata

<400> 332
agggtaacga aaatggggaa ggtgacaata tggctgcatg gctcactgga ataaacactc 60
ttcgcatcca gcccttcaaa cttccgcctc ttggccccca tgatgcgaag gtgcgcatga 120
nggctgtggg tatctgtggc agtgacgtcc actatttgan gacattacgg tgtgcggact 180
ttattgtaaa anagccaatg gtgattggtc atgagtctgc tggaataatt gaggaggttg 240
gcagtgaagt gaaacatctg gttcctggtg accgcgtact ttggagcctg gaatatcgtg 300
ttggcgttgt gaccaatgta agcnaggctc ctacaatttg tgtcccgaga tgaagttttt 360
tgcaacacct cccgtgcatg gttccttggc caatcagatt gttcatcctg cagatttatg 420
tttcaagttg cca 433

<210> 333
<211> 466
<212> DNA
<213> Pinus radiata

<400> 333
gaggaatagg aacaggaccc tcttttgttg ggcacacttg catctgtctt tgttccagca 60
atgtcaggag cagctgctgc gattacactg aataatggcc acaaaatgcc catcattggg 120
cttggagtgt ggagaatgga gggtcaggaa ataagagacc ttatcttcaa tgcactacac 180
atagggtacc gtcatttcga ttgtgcagct gattacagga atgaaaagga agttggtcaa 240
gcacttgcgg aggcctttca gcaaggcttg gtgaaacgag aggatatttt tattactacc 300
aagctatgga attcagacca tggacatgtt cttgaggcat gcaaggacag tttaaagaat 360
ctgcagttgg aatatttgga cctgtacttg gttcattttc caatagccac acgacataca 420
ggggttggaa caactgatag tgccttagac gaagatggtg ttctcg 466

<210> 334
<211> 483
<212> DNA
<213> Pinus radiata

<400> 334
gggtaacgaa aatggggaag gtgacaatat ggctgcatgg ctcactggaa taaacactct 60
tcgcatccag cccttcaaac ttccgcctct tggccccat gatgcgaagg tgcgcatgaa 120
ggctgtgggt atctgtggca gtgacgtcca ctatttgagg acattacggt gtgcggactt 180
tattgtaaaa gagccaatgg tgattggtca tgagtctgct ggaataattg aggaggttgg 240
cagtgaagtg aaacatctgg ttcctggtga ccgcgtagct ttggagcctg gaatatcgtg 300
ttggcgttgt gaccaatgta agcgaggctc ctacaatttg tgtcccgaga tgaagttttt 360
tgcaacacct cccgtgcatg gttccttggc caatcagatt gttcatcctg cagatttatg 420
tttcaagttg ccagataatg taagtctcga ggaaggtgcc atgtgtgaac cactcagtgt 480
tgg 483

<210> 335
<211> 329
<212> DNA
<213> Pinus radiata

<400> 335
gggtaacgaa aatggggaag gtgacaatat ggctgcatgg ctcactggaa taaacactct 60
tcgcatccag cccttcaaac ttccgcctct tggccccat gatgcgaagg tgcgcatgaa 120
ggctgtgggt atctgtggca gngacgtcca ctatttgagg acattacggt gtgcggactt 180
tattgtaaaa gagccaatgg tgattggtca tgagtctgct ggaataattg aggaggttgg 240
cagtgaagtg aaacatctgg ttcctggtga ccgcgtagct ttggagcctg gaatatcgng 300
ttggcgttgn gaccaatgta agcgaggct 329

<210> 336
<211> 419
<212> DNA
<213> Pinus radiata

<400> 336
ctcagggtaa cgaaaatggg gaaggtgaca atatggctgc atggctcact ggaataaaca 60
ctcttcgcat ccagcccttc aaacttccgc ctcttggccc ccatgatgcg aaggtgcgca 120
tgaaggctgt gggtatctgt ggcagtgacg tccactattt gaggacatta cggtgtgcgg 180
actttattgt aaaagagcca atggtgattg gtcatgagtc tgctggaata attgaggagg 240
ttggcagtga agtgaaacat ctggttcctg gtgaccgcgt agctttggag cctggaatat 300
cgtgttggcg ttgtgaccaa tgtaagcgag gctcctacaa tttgtgtccc gagatgaagt 360
tttttgcaac acctcccgtg catggttcct tggccaatca gattgttcat cctgcagat 419

<210> 337
<211> 392
<212> DNA
<213> Pinus radiata

<400> 337
ctcagggtaa cgaaaatggg gaaggtgaca atatggctgc atggctcact ggaataaaca 60
ctcttcgcat ccagcccttc aaacttccgc ctcttggccc ccatgatgcg aaggtgcgca 120
tgaaggctgt gggtatctgt ggcagtgacg tccactattt gaggacatta cggtgtgcgg 180
actttattgt aaaagagcca atggtgattg gtcatgagtc tgctggaata attgaggagg 240
ttggcagtga agtgaaacat ctggttcctg gtgaccgcgt agctttggag cctggaatat 300
cgtgttggcg ttgtgaccaa tgtaagcgag gctcctacaa tttgtgtccc gagatgaagt 360
tttttgcaac acctcccgtg catggttcct tg 392

<210> 338
<211> 362
<212> DNA
<213> Pinus radiata

<400> 338
ctaaccaaag ggaaaaaaaa tggggaaggg agcaatgtct cagggtaacg aaaatgggga 60
aggtgacaat atggctgcat ggctcactgg aataaacact cttcgcatcc agcccttcaa 120
acttccgcct cttggccccc atgatgcgaa ggtgcgcatg aaggctgtgg gtatctgtgg 180
cagtgacgtc cactatttga ggacattacg gtgtgcggac tttattgtaa aagagccaat 240
ggtgattggt catgagtctg ctggaataat tgaggaggtt ggcagtgaag tgaaacatct 300
ggttcctggt gaccgcgtag ctttggagcc tggaatatcg tgttggccgt tgtgaccaat 360
gt 362

<210> 339
<211> 417
<212> DNA
<213> Pinus radiata

<400> 339
aaaaaaatgg ggaagggagc aatgtctcag ggtaacgaaa atggggaagg tgacaatatg 60
gctgcatggc tcactggaat aaacactctt cgcatccagc ccttcaaact tccgcctctt 120
ggcccccatg atgcgaaggt gcgcatgaag gctgtgggta tctgtggcag tgacgtccac 180
tatttgagga cattacggtg tgcggacttt attgtaaaag agccaatggt gattggtcat 240
gagtctgctg gaataattga ggaggttggc agtgaagtga aacatctggt tcctggtgac 300
cgcgtagctt tggagcctgg aatatcgtgt tggcgttgtg accaatgtaa gcgaggctcc 360
tacaatttgt gtcccgagat gaagtttttt gcaacacctc ccgtgcatgg ttccttg 417

<210> 340
<211> 343
<212> DNA
<213> Pinus radiata

<400> 340
ccaaagggaa aaaaatgggg aagggagcaa tgtctcaggg taacgaaaat ggggaaggtg 60
acaatatggc tgcatggctc actggaataa acactcttcg catccagccc ttcaaacttc 120
cgcctcttgg cccccatgat gcgaaggtgc gcatgaaggc tgtgggtatc tgtggcagtg 180
acgtccacta tttgaggaca ttacggtgtg cggactttat tgtaaaagag ccaatggtga 240
ttggtcatga gtctgctgga ataattgagg aggttggcag tgaagtgaaa catctggttc 300
ctggtgaccg cgtagctttg gagcctggaa tatcgtgttg gcg 343

<210> 341
<211> 590
<212> DNA
<213> Pinus radiata

<400> 341

attggtcatg agtctgctgg aataattgag gaggttggca gtgaagtgaa acatctggtt 60
cctggtgacc gcgtagcttt ggagcctgga atatcgtgtt ggcgttgtga ccaatgtaag 120
cgaggctcct acaatttgtg tcccgagatg aagtttttg caacacctcc cgtgcatggt 180
tccttggcca atcagattgt tcatcctgca gatttatgtt tcaagttgcc agataatgta 240
agtctcgagg aaggtgccat gtgtgaacca ctcagtgttg gggttcatgc ttgtcgccgt 300
gcttctgtag gccctgagac aaatgtcttg gtaatggggg caggtcctat cggccttgtc 360
accgtgctgt ctgcacgtgc atttggagct tcacgaatta ttattgctga tgtagatgaa 420
gagcgtctgt caatggctaa aaaggttggc tccgatgaat gcgtcttagt ctccagagac 480
tctcaggata ttgatgaaga agtgacccgc atacaaaatg ccatgggtgg aaacatagat 540
gtaactttttg attgtgctgg ttttgctaaa accatgtcga cggctctaaa 590

<210> 342
<211> 372
<212> DNA
<213> Pinus radiata

<400> 342
atctaaccaa agggaaaaaa atggggaagg gagcaatgtc tcagggtaac gaaaatgggg 60
aaggtgacaa tatggctgca tggctcactg gaataaacac tcttcgcatc cagcccttca 120
aacttccgcc tcttggcccc catgatgcga aggtgcgcat gaaggctgtg ggtatctgtg 180
gcagtgacgt ccactatttg aggacattac ggtgtgcgga ctttattgta aaagagccaa 240
tggtgattgg tcatgagtct gctggaataa ttgaggaggt tggcagtgaa gtgaaacatc 300
tggttcctgg tgaccgcgta gctttggagc ctggaatatc gtgttggcgt tgtgaccaat 360
gtaagcgagg ct 372

<210> 343
<211> 378
<212> DNA
<213> Pinus radiata

<400> 343
gtggcagtga cgtccactat ttgaggacat tacggtgtgc ggactttatt gtaaaagagc 60
caatggtgat tggtcatgag tctgctggaa taattgagga ggttggcagt gaagtgaaac 120
atctggttcc tggtgaccgc gtagctttgg agcctggaat atcgtgttgg cgttgtgacc 180
aatgtaagcg aggctcctac aatttgtgtc ccgagatgaa gtttttttgca acacctcccg 240
tgcatggttc cttggccaat cagattgttc atcctgcaga tttatgtttc aagttgccag 300
ataatgtaag tctcgaggaa ggtgccatgt gtgaaccact cagtgttggg gttcatgctt 360
gtcgcccgtg cttctgta 378

<210> 344
<211> 510
<212> DNA
<213> Pinus radiata

<400> 344
agcaatgtct cagggtaacg aaaatgggga aggtgacaat atggctgcat ggctcactgg 60
aataaacact cttcgcatcc agcccttcaa acttccgcct cttggccccc atgatgcgaa 120
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gatgaagttt tttgcaacac ctccccgtgca tggttccttg gccaatcaga ttgttcatcc 420
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accactcagt gttggggttc atgcttgtcg 510

<210> 345
<211> 504

<212> DNA
<213> Pinus radiata

<400> 345
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catgaaggct gtgggtatct gtggcagtga cgtccactat ttgaggacat tacggtgtgc 180
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atcgtgttgg cgttgtgacc aatgtaagcg aggctcctac aatttgtgtc ccgagatgaa 360
gtttttgca acacctcccg tgcatggttc cttggccaat cagattgttc atcctgcaga 420
tttatgtttc aagttgccag ataatgtaag tctcgaggaa ggtgccatgt gtgaaccact 480
cagtgttggg gttcatgctt gtcg 504

<210> 346
<211> 426
<212> DNA
<213> Pinus radiata

<400> 346
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tgtgcggact ttattgtaaa agagccaatg gtgattggtc atgagtctgc tggaataatt 240
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ggaatatcgt gttggcgttg tgaccaatgt aagcgaggct cctacaattt gtgtcccgag 360
atgaagtttt ttgcaacacc tcccgtgcat ggttccttgg ccaatcagat tgttcatcct 420
gcagat 426

<210> 347
<211> 534
<212> DNA
<213> Pinus radiata

<400> 347
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gtgccatgtg tgaaccactc agtgttgggg ttcatgcttg tcgccgtgct tctgtaggcc 180
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tggctaaaaa ggttggctcc gatgaatgcg tcttagtctc cagagactct caggatattg 360
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gtgctggttt tgctaaaacc atgtcgacgg ctctaaagct acgtctgctg cggtaaggta 480
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<210> 348
<211> 352
<212> DNA
<213> Pinus radiata

<400> 348
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acattacggt gtgcggactt tattgtaaaa gagccaatgg tgattggtca tgagtctgct 240
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<210> 349
<211> 340
<212> DNA
<213> Pinus radiata

<400> 349
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catgaaggct gtgggtatct gtggcagtga cgtccactat ttgaggacat tacggtgtgc 180
ggactttatt gtaaaagagc caatggtgat tggtcatgag tctgctggaa taattgagga 240
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atcgtgttgg cgttgtgacc aatgtaagcg aggctcctac 340

<210> 350
<211> 337
<212> DNA
<213> Pinus radiata

<400> 350
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gtgcgcatga aggctgtggg tatctgtggc agtgacgtcc actatttgag gacattacgg 180
tgtgcggact ttattgtaaa agagccaatg gtgattggtc atgagtctgc tggaataatt 240
gaggaggttg gcagtgaagt gaaacatctg gttcctggtg accgcgtagc tttggagcct 300
ggaatatcgt gttggcgttg tgaccaatgt aagcgag 337

<210> 351
<211> 500
<212> DNA
<213> Pinus radiata

<400> 351
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actcttcgca tccagccctt caaacttccg cctcttggcc cccatgatgc gaaggtgcgc 120
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gttggcagtg aagtgaaaca tctggttcct ggtgaccgcg tagctttgga gcctggaata 300
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agtgttgggg ttcatgcttg 500

<210> 352
<211> 589
<212> DNA
<213> Pinus radiata

<400> 352
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cactcttcgc atccagccct tcaaacttcc gcctcttggc cccatgatg cgaaggtgcg 120
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gttttttgca acacctcccg tgcatggttc cttggccaat cagattgttc atcctgcaga 420
tttatgtttc aagttgccag ataatgtaag tctcgaggaa ggtgccatgt gtgaaccact 480

cagtgttggg gttcatgctt gtcgccgtgc ttctgtaggc cctgagacaa atgtcttggt 540
aatgggggca ggtcctatcg gccttgtcac cgtgctgtct gcacgtgca 589

<210> 353
<211> 332
<212> DNA
<213> Pinus radiata

<400> 353
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gacgtccact atttgaggac attacggtgt gcggacttta ttgtaaaaga gccaatggtg 180
attggtcatg agtctgctgg aataattgag gaggttggca gtgaagtgaa acatctggtt 240
cctggtgacc gcgtagcttt ggagcctgga atatcgtgtt ggcgttgtga ccaatgtaag 300
cgaggctcct acaatttgtg tcccgagatg aa 332

<210> 354
<211> 312
<212> DNA
<213> Pinus radiata

<400> 354
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acattacggt gtgcggactt tattgtaaaa gagccaatgg tgattggtca tgagtctgct 180
ggaataattg aggaggttgg cagtgaagtg aaacatctgg ttcctggtga ccgcgtagct 240
ttggagcctg gaatatcgtg ttggcgttgt gaccaatgta agcgaggctc ctacaatttg 300
tgtcccgaga tg 312

<210> 355
<211> 432
<212> DNA
<213> Pinus radiata

<400> 355
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ctctacgacg cagaccctgc agctctccat gcattcagtg gtaccgacat taaaatcacc 120
attgcccttc ccaatgagga actctcgaac gttgctcgtc gtctttcgcg agcctatgcc 180
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aatattcaca tggctctcgt caaatacaac ctcgacggaa ttatcaaggt gtcgagcccc 360
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gtggaaccac ga 432

<210> 356
<211> 384
<212> DNA
<213> Pinus radiata

<400> 356
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aggcatagct gtagggaacg aggtttacac aggaactgac acgcagttaa tggcaaacct 120
ggttcccgca atgaaaaaca tccattcggc ccttgtcagc atcggtgcag acatgaatat 180
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gatatccctg gcttatgtac tatt 384

<210> 357
<211> 420
<212> DNA
<213> Pinus radiata

<400> 357
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gatggtgata aaataggagt ggactatggc atggacgcaa gccatcttcc atctgcagac 120
gaggtggtaa ctttgatgaa gtccaacaac attgggaaaa ctagaattta ccaggaaaac 180
gatgttgtac tgcaagcttt cgcgaattct ggtatcgatg taatagtggg tgtcgctaac 240
gaagaactga agaacatatc ttccagccaa gactncgcaa accgttgggt tagcgagcac 300
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ataggcgatg ccaacaacgt accctatctt gttccggcca tgaacaacat tcaaactgcg 420

<210> 358
<211> 399
<212> DNA
<213> Pinus radiata

<400> 358
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caacttattc gatgccctcg tcgataccct tctttctgcc atggaggact tggggtatcg 120
caacatccca ctcatcgtta ctgaaagcgg atggccttct ggtggcaatg atgtggccac 180
ggttgacaac gctcgcgttt ataacaacaa tctcatccgc catgtgctct caaatgtagg 240
gactcccaag aggccgggaa cgagcattga gacctacatc ttcgcacttt tcaacgagaa 300
cagaaaagct ggtgatgaga cggagcgtca ctttgggctt ttctacctta accaacaatc 360
tgtatactct ctaaacttta ctccgtaact gcgtcgcag 399

<210> 359
<211> 469
<212> DNA
<213> Pinus radiata

<400> 359
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caacttattc gatgccctcg tcgataccct tctttctgcc atggaggact tggggtatcg 120
caacatccca ctcatcgtta ctgaaagcgg atggccttct ggtggcaatg atgtggccac 180
ggttgacaac gctcgcgttt ataacaacaa tctcatccgc catgtgctct caaatgtagg 240
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cagaaaagct ggtgatgaga cggagcgtca ctttgggctt ttctacctta accaacaatc 360
tgtatactct ctaaacttta ctccgtaact gcgtcgcagt ccgacgaacg aatagagcca 420
atatgaatat gtcctctata tgtcaactgc ctcgatagat atattatgt 469

<210> 360
<211> 473
<212> DNA
<213> Pinus radiata

<400> 360
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ctgttgtctg accattttaa tgtacgttat ggcttcgttc caacgccagc cttgtacatt 120
gcaggccttt gcattctgca ttattgttct ttgctctttc tatgcagacg ctggaacagt 180
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catcggtagc aacccggagg ctgccgcagg gtgggtgcag ggaaacgttg tgcccttcca 420

cccggcgacc cggatcgaat acatcgcggt gggcaacgag gttttgcaca gca 473

<210> 361
<211> 441
<212> DNA
<213> Pinus radiata

<400> 361
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ttcctggaca tctacccgtt cttcgcctgg agcgcgaacc ccgccaacgt gtctctggac 120
tacgctacgt tgagcctgga ccgcaacacg gcggaattcc aagacgccgg gctcagctac 180
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ccgggcacca atgtcccgaa cgccacgctg tacaaccagc agctcgtaca aaaggccctc 360
gccgacccgc cacgggggac accccggcgc cccggngcct tcatccccac ctatattttc 420
tccctcttta acgaggacca g 441

<210> 362
<211> 351
<212> DNA
<213> Pinus radiata

<400> 362
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ttctgtcaca gaacggcggt cccttcatgg cggatgtcta tccatacttc agctacatcg 120
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ccatggaagc ctcggggtat cccaacatcc cgatcgtcat taccgaaagt ggatggcctt 300
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<210> 363
<211> 388
<212> DNA
<213> Pinus radiata

<400> 363
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agtgaactac gggatgcaag gagacaacct gccacctgca gaccaggtgg taactttgct 120
gaacggccac aacatcggga aaatgaagct tttcaatcca gacggtggtg cattgaatgc 180
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ctcctccagc caggactcag caaatggttg ggttaatgac aatattgtgc gctattccag 300
caccagtatc aaatatattg cggtgggcaa cgaggttttg cctagcacgc agtaccgtat 360
cgtatcttgt tccagccatg aacaacat 388

<210> 364
<211> 560
<212> DNA
<213> Pinus radiata

<400> 364
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caccacaaca ggaatcaact atggacaagt tgcagacgac ttgccaccac cggaactagt 120
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tgcacacaag ttaatggcaa acctagttcc tgcaatgcaa aacattcatt cggccctagt 420

cagcattggt gcggacacgg atattataat tagcactccc cattctcttg gtgtacttgc 480
gacttcatat ccaccatctg ctggttcatt tcaaccagga ctggagagcc tactggaaca 540
gcttttggct ctcctgtctc 560

<210> 365
<211> 494
<212> DNA
<213> Pinus radiata

<400> 365
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ttcctccacc atctgcagta gcaaagctgg ttcagagtac aagtatttca aagttgagac 120
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acctacacac tgcccttgtt gaggtttcac ttgaccagca aattaaggtc tccacacctc 420
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ttgacatgaa atcc 494

<210> 366
<211> 365
<212> DNA
<213> Eucalyptus grandis

<400> 366
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acgag 365

<210> 367
<211> 435
<212> DNA
<213> Pinus radiata

<400> 367
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gcggagaacc gttccatcaa ggacaggctg attatttggt taaggctatt ggatgggcac 120
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ctgcgaacaa cattggctcg nagttatggg agtatccgca ctccatttgg caattcaacg 420
caaagccaca tgctt 435

<210> 368
<211> 630
<212> DNA
<213> Pinus radiata

<400> 368
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ttacaatctc tacgatgacg ccactttcaa aaatatgacg gttcagcaga acatcgacta     600
catcaaaacc acaagagctc aaactctgca                                      630

      <210> 369
      <211> 507
      <212> DNA
      <213> Pinus radiata

      <400> 369
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acggagagtg actttgcatt catgtccagt aatggtataa atgctgtgag aattccagtt     120
ggatggtgga ttgccagtga ccccaatcct cctgctccgt ttgtaggagg atctctgaaa     180
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ggcaggtatg cttcaaactc agctctcctg ggaattgagt tgctgaatga accccgagca     420
cccggtgtac cggtgaacac attgaaaaca tattataaaa ggggttatga caccgttcga     480
aagcattcgt cctctgccta tgtgata                                         507

      <210> 370
      <211> 480
      <212> DNA
      <213> Pinus radiata

      <400> 370
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ctcgtgggca cagaaccatg acattaaggt gattatcgat ctccatgctg ctccgggctc     420
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      <210> 371
      <211> 366
      <212> DNA
      <213> Pinus radiata

      <400> 371
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ggccttggac ctgacaaagc tcctcaagtc atgaatgatc actggaacag cttcattacg     180
gagagtgact ttgcattcat gtccagtaat ggtataaatg ctgtgagaat tccagttgga     240
tggtggattg ccagtgaccc caatcctcct gctccgtttg taggaggatc tctgaaagct     300
ctggataacg cattcacatg ggctaagaat cataacatag gggtaattgt ggatctccat     360
gctgct                                                                366

      <210> 372
      <211> 427
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<212> DNA
<213> Pinus radiata

<400> 372
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ggaatgcgcc ggtaataaag aactgtgcgg tcgcaacggt acgttgcaga ctattggcat      60
aggcataaac ggtgtacggc ggcgggcatt cccccgattt caccatcccc tgctctgcca     120
gccattcacg catgtaatgg cccatataca cttcgagcac gccacctttg gtggtgagtt     180
gcccaccggg gacgtcccat tctggccatt tattcggcgt cgactgctcc agcacactgg     240
ccattgttcg ccagcggngc acgtaagtta tggcggctca tcatgagcac ttgctgtagc     300
tgatagcctt ccggtacgnt tgtgcctgag cggtttgaag cgagttaaac tatccctgcc     360
acagctgcgg gattagcgtt ttgttcaatc ctggcacctc ttttggttat caatcactaa     420
gagtgtg                                                               427
```

<210> 373
<211> 384
<212> DNA
<213> Eucalyptus grandis

<400> 373
```
atgaatatta tctgcacgtt atgaatatta tcgcggttcc agnggggcaa aaagaatcga      60
ttctttttgc ccctctgaat actatctgca cgttatgaat attttggaac tgatggtcgt     120
ggtggatatt ttgatgaata cgggatcatc cgtgatatta ttcaaaacca tcntttgcag     180
gttttctgtc tggttgccat ggaaaanccc gtatctctca aaccagagca caattcgcga     240
tgagaaagtg aaggtccttc aatcagtact tccgattaca gatgaagagg ttgttcttgg     300
acaatatgaa gnttnagggn cgatccaatg tccctgacaa ttcaaatact cccacttttg     360
caactatggt tctacgtata cata                                            384
```

<210> 374
<211> 368
<212> DNA
<213> Eucalyptus grandis

<400> 374
```
ggcagggaaa gctctaaact caagaaaagc agagatacgt gtccaattta aggatgttcc      60
tggggatata ttcaaatgta agaagcaagg gagaaatgag ttcgtaattc gcctacaacc     120
ttctgaagcc atgtacatga aactcacggt caagcagcct gggttggata tgtcaaccgt     180
gcagagtgaa cttgatttgt catatcggca acgttatcaa ggagtcgtaa ttcctgaggc     240
atatgagcgt cttatacttg acacgtacat ttctttcctc tttatttaga gtacttccaa     300
cttaaaaaaa tctcgtagct ctttgtttgg agcttagctc agtggagtag acttgcattc     360
aggcgggc                                                              368
```

<210> 375
<211> 161
<212> DNA
<213> Eucalyptus grandis

<400> 375
```
ggcagggaaa gctctaaact caagaaaagc agagatacgt gtccaattta aggatgttcc      60
tggggatata ttcaaatgta agaagcaagg gagaaatgag ttcgtaattc gcctacaacc     120
ttctgaagcc atgtacatga aactcacggt caagcagcct g                         161
```

<210> 376
<211> 283
<212> DNA
<213> Eucalyptus grandis

<400> 376

gtgcagatag tattcagaga agattttgga actgatggtc gtggtggata tttggatgaa 60
tacgggatca tccgtgatat tattcaaaac catcttttgc aggttttctg tctggttgcc 120
atggaaaaac ctgtatctct caaaccagag cacattcgcg atgagaaagn gaaggtcctt 180
caatcantac ttccgattac agatgaagag gttgttcttg gacaatatga aggttacagg 240
gacgatccaa ctgtccctga caattcaaat actcccactt ttg 283

<210> 377
<211> 363
<212> DNA
<213> Eucalyptus grandis

<400> 377
cacggtcaag cagcctgggt tggatatgtc aaccgtgcag agtgaacttg atttgtcata 60
tcggcaacgt tatcaaggag tcgtaattcc tgaggcatat gagcgtctta tacttgacac 120
aatcaggggc gaccaacagc actttgttcg gagagatgaa cttaaggcgg cttgggagat 180
ttttacaccg atgcttcaca gaattgacga tggtgaattt aagccaattc cataccaacc 240
agggagccga ggtcctgttg aagcggacga gctgctggaa aaagctggtt acgttcaaac 300
gcatggttac atttggatcc ctccaacctt gtagatatga agacaccgcc acaaataaat 360
ttc 363

<210> 378
<211> 457
<212> DNA
<213> Pinus radiata

<400> 378
gtcgcttaaa gatgttgtgg cagtcaggta ttggtggcag ctttctgggt ccactttttg 60
tgcacagtgc tcttcaaaca gatcctgagg cagctcaatg tgcaaatggg cgtcaactgc 120
gatttctagc aaatgttgat ccagttgatg tcgctcggag tattgatggg ttaaacccgg 180
aaactacatt agttgttgtg gtatcaaaga cattcacaac agcagaaacc atgctaaatg 240
ctcgaacatt aaggacatgg atcacatctg cccttggttc tgaagctgtt gcaaagcaca 300
tggtggcagt tagtactaac cttaagcttg taaaagaatt tggaatagac ccacaaaatg 360
cttttgcatt ctgggattgg gttggcggtc gctacagcgt gtgcagtgct gtgggtgccc 420
tccccttatc acttcagtat gggtttccta ttgttag 457

<210> 379
<211> 386
<212> DNA
<213> Pinus radiata

<400> 379
gtcgctcgga gtattgatgg gttaaacccg gnaactacat tagttgttgt ggtatcaaag 60
acattcacaa cagcagaaac catgctaaat gctcgaacat taaggacatg gatcacatct 120
gcccttggtt ctgaagctgt tgcaaagcac atggtggcag ttagtactaa ccttaagctt 180
gtaaaagaat ttggaataga cccacaaaat gcttttgcat tctgggattg ggttggcggt 240
cgctacagcg tgtgcagtgc tgtgggtgcc ctccccttat cacttcagta tgggtttcct 300
attgttagca agtttctgga gggagcaaga agtatagata accatttcca cacaactcca 360
tttgagaaaa atattcctgt tttgct 386

<210> 380
<211> 365
<212> DNA
<213> Pinus radiata

<400> 380
tgcagtgctg tgggtgccct ccccttatca cttcaatatg ggtttcctat tgttagcaag 60
tttctggagg gagcaagaag tatagataac catttccaca caactccatt tgagaaaaat 120

attcctgttt tgcttggtct cctcagtgtg tggaatgttt cctttcttgg gtatccagct 180
agggctatct tgccatacac tcaggctctg gagaagtttg caccgcacat ccagcagctt 240
agcatggaga gtaatgggaa gggagtttct attgatggtg tgcccctcaa ttttgaggct 300
ggtgaaatag attttggaga acctggtaca aatggccagc atagctttta ccagttaatt 360
catca 365

<210> 381
<211> 491
<212> DNA
<213> Pinus radiata

<400> 381
tgcagtgctg tgggtgccct ccccttatca cttcaatatg ggtttcctat tgttagcaag 60
tttctggagg gagcaagaag tatagataac catttccaca caactccatt tgagaaaaat 120
attcctgttt tgcttggtct cctcagtgtg tggaatgttt cctttcttgg gtatccagct 180
agggctatct tgccatacac tcaggctctg gagaagtttg caccgcacat ccagcagctt 240
agcatggaga gtaatgggaa gggagtttct attgatggtg tgcccctcaa ttttgaggct 300
ggtgaaatag attttggaga acctggtaca aatggccagc atagctttta ccagttaatt 360
catcagggtc gtgtaattcc ttgtgatttt attggcatcg tcaagagcca gcagcccatt 420
tatttacaag ggaagttgt gagtaaccac gatgagctta tgtctaactt ttttgcacag 480
ccggatgctc t 491

<210> 382
<211> 446
<212> DNA
<213> Eucalyptus grandis

<400> 382
tatgcgcaga ggcaaaatca atgttcggta tctcagaatt cctaatgaaa tcagatccaa 60
gtagtgaaaa gtactctcca gggttcacgg ttggcttttt cggactattg ggaccataaa 120
atccctcaag gcccacagtc agcagatggt tcttgtcaat tgattttaca tatgctgaca 180
tttccacaat ccaatcctga agagtatcac ccgaattatc tgtcatgcaa cgtggctcat 240
ttattaactc ccatccaaaa atggtgggat cattcctata ttcaacgcca gtaatggtgt 300
tcttccttgt taggataacc ttgacataat ctttgaagta ctgccgaata gaaggatcgt 360
agaaaaacga atcatttgac gagcttaaac caatgccttc ttcccacgcc cacttgacgt 420
actgagtctt gccaccatat gcttcc 446

<210> 383
<211> 464
<212> DNA
<213> Eucalyptus grandis

<400> 383
tatgcgcaga ggcaaaatca atgttcggta tctcagaatt cctaatgaaa tcagatccaa 60
gtagtgaaaa gtactctcca gggttcacgg ttggcttttt cggactattg ggaccataaa 120
atccctcaag gcccacagtc agcagatggt tcttgtcaat tgattttaca tatgctgaca 180
tttccacaat ccaatcctga agagtatcac ccgaattatc tgtcatgcaa cgtggctcat 240
ttattaactc ccatccaaaa atggngggat cattcctata ttcaacgcca gtaatggtgt 300
tcttccttgt taggataacc ttgacataat ctttgaagta ctgccgaata gaaggatcgt 360
agaaaaacga atcatttgac gagcttaaac caatgccttc ttcccacgcc cacttgacgt 420
actgagtctt gccaccatat gcttccaagt tattaactaa gcta 464

<210> 384
<211> 385
<212> DNA
<213> Eucalyptus grandis

<400> 384
tatgcgcaga ggcaaaatca atgttcggta tctcagaatt cctaatgaaa tcagatccaa 60
gtagtgaaaa gtactctcca gggttcacgg ttggcttttt cggactattg ggaccataaa 120
atccctcaag gcccacagtc agcagatggt tcttgtcaat tgattttaca tatgctgaca 180
tttccacaat ccaatcctga agagtatcac ccgaattatc tgtcatgcaa cgtggctcat 240
ttattaactc ccatccaaaa atggtgggat cattcctata ttcaacgcca gtaatggtgt 300
tcttccttgn taggataacc ttgacataat ctttgaagta ctgccgaata gaaggatcgt 360
agaaaaacga atcatttgac gagct 385

<210> 385
<211> 433
<212> DNA
<213> Eucalyptus grandis

<400> 385
tatgcgcaga ggcaaaatca atgttcggta tctcagaatt cctaatgaaa tcagatccaa 60
gtagtgaaaa gtactctcca gggttcacgg ttggcttttt cggactattg ggaccataaa 120
atccctcaag gcccacagtc agcagatggt tcttgtcaat tgattttaca tatgctgaca 180
tttccacaat ccaatcctga agagtatcac ccgaattatc tgtcatgcaa cgtggctcat 240
ttattaactc ccatccaaaa atggtgggat cattcctata ttcaacgcca gtaatggtgt 300
tcttccttgt taggataacc ttgacataat ctttgaagta ctgccgaata gaagggatcg 360
tagaaaaacg aatcatttga cgagcttaaa ccaatgcctt cttcccacgc ccacttggac 420
gtactgagtc ttg 433

<210> 386
<211> 349
<212> DNA
<213> Pinus radiata

<400> 386
gggtttgtca ctactagcgg caccgagttt gagttggacg gnaagccatt tgcgtttgtt 60
ggcgcaaatt catattggct cccacttctg acggatcctg atnacgtcga gtcgacgttc 120
cagcagatgg aggacgctgg tatcaaggtt cttcgtactt ggggcttcaa tgctattaat 180
gcgactgaat taccgacggc gctcgccacc aaccttacct actaccaggt ctgggatgag 240
ggcaccttca ctctcaatga aggtccgcag ggtcttcagc gcctcgatgc agtcgtcgcg 300
gcagcggagc gacacaatat caagatgatc atcgcgttca cgaacaact 349

<210> 387
<211> 438
<212> DNA
<213> Pinus radiata

<400> 387
ctggccctcg tagaatcctg ggtccttgga tgatttccca aactctgcaa acagaactgg 60
tttcttcagt attttgtttg catcttccaa atgggttgat atccaatcat gtagaaatga 120
aatctgggca tcctcatttg atcctgccaa ccagatatca gggtaggaat gaacagttgc 180
aaaatcaatt cctgtgattt ggttattggt gatgaaattt gtccccacag agaagccggg 240
attgttccct ttgttggact ctccataaaa cccttccaag ccaacctcga ggagatgact 300
tccatcgatg gatttgacat gactagccat ttcctctatc catccctgta tggtagcccc 360
cgaaggatca ctttgacaac gaggctcgtt catcaactcc catgcaaaga ttgtagggtc 420
atccttgnag gctactct 438

<210> 388
<211> 414
<212> DNA
<213> Pinus radiata

<400> 388
ggggtttgtc actactagcg gcaccgagtt tgagttggac gggaagccat ttgcgtttgt 60
tggcgcaaat tcatattggc tcccacttct gacggatcct gatgacgtcg agtcgacgtt 120
ccagcagatg gaggacgctg gtatcaaggt tcttcgtact tggggcttca atgctattaa 180
tgcgactgaa ttaccgacgg cgctcgccac caaccttacc tactaccagg tctgggatga 240
gggcaccttc actctcaatg aaggtccgca gggtcttcag cgcctcgatg cagtcgtcgc 300
ggcagcggag cgacacaata tcaagatgat catcgcgttc acgaacaact gggtgggata 360
cggaggattg gatctctatg ttcgctggat cattcctggg agtacgcacg acga 414

<210> 389
<211> 625
<212> DNA
<213> Pinus radiata

<400> 389
gttgactaga gtgaacagca ttactggagt agcctacaag gatgacccta caatctttgc 60
atgggagctc atgaacgagc ctcgttgtca aagtgatcct tctgggagga ccatccaggg 120
atggatagag gagatggcta gccaggtcaa atccattgat ggaaaccatc ttctggaggc 180
tggtttggaa ggtttttatg gagaatacaa aaaagagatc aatccaggct tctctgtggg 240
tacagatttc atcaccaata accaaatcag aggacttgat tttgcaacag ttcattccta 300
tcctgacatt tggcttgctg ggcagatga ggagacccag ctttcatttt tgcagagttg 360
gataaagaac catctgcaag atggaagcag gatattgaaa aaaccagttt tgtttgcaga 420
gtttgggaaa tcttacaaaa gcccaggatt tcacatgagt gagagagaca atttacttga 480
tatggtttat aaacatgtat atgcatctgc taaatgggga ggagcaggtg gaggggccat 540
gttttggcag ctgatggcag aangaatgag ctcatatgga gatgggtatg agattgtttt 600
gtctgagaat ccatccacag cagct 625

<210> 390
<211> 78
<212> DNA
<213> Eucalyptus grandis

<400> 390
caccaccggc aggtgatcca gagacggatt ttcggcccat gcttcggtca gcgccggacg 60
cagttggttc tggctggc 78

<210> 391
<211> 178
<212> DNA
<213> Eucalyptus grandis

<400> 391
accccttca ggcgttggtt agcgttcggt gtgcggcggc cgttaaacca gtcgagcacc 60
accggcaggt gatccagaga cggatttttg gcccatgctt cggtcagcgc cggaagcagt 120
tgtttctggc tggcgttgat ttgcgttttc agttccggat gctgggcagg caagctgt 178

<210> 392
<211> 359
<212> DNA
<213> Eucalyptus grandis

<400> 392
accccttca ggcgttggtt agcgttcggt gtgcggcggc cgttaaacca gtcgagcacc 60
accggcaggt gatccagaga cggatttttg gcccatgctt cggtcagcgc cggaagcagt 120
tgtttctggc tggcgttgat ttgcgttttc agttccggat gctgggcggc aagctgttcc 180
agcggccagc cgagtacgcg accaaaccag gcgtagatat caccaaacgc cgattggcct 240
gcttncagac cgataaatcc aggcaccacg ctgctggcac tacacccagg atgtcggcaa 300

ggtggcggaa cacgcagaaa tctgcggccg ctgtgtcagc aacgtcgccg gtgacggtg 359

<210> 393
<211> 510
<212> DNA
<213> Eucalyptus grandis

<400> 393
acccctttca ggcgttggtt agcgttcggt gtgcggcggc cgttaaacca gtcgagcacc 60
accggcaggt gatccagaga cggatttttg gcccatgctt cggtcagcgc cggaagcagt 120
tgtttctggc tggcgttgat ttgcgttttc agttccggat gctgggcggc aagctgttcc 180
agcggccagc cgagtacgcg accaaaccag gcgtagatat caccaaacgc cgattggcct 240
gcttccagac cgataaatcc aggcaccacg ctgctggcac tacacccagg atgtcggcaa 300
ggtggcggaa cacgcagaaa tctgcggccg ctgtgtcagc aacgtcgccg gtgacggtga 360
aaaacgtaag tttgcctgat gagtcaatcg atctgttcaa cagggctacg ctggctgtgg 420
ctggtggtaa gtcgtgctga ttatcgatct gggcagcaaa tacctgatcc tccagaactt 480
tgctctgggg gatacggtcc cgctgttccc 510

<210> 394
<211> 469
<212> DNA
<213> Pinus radiata

<400> 394
gaggtacgcg gttatagcat gacccgtgtt cagggtgaag agtttacgtt cgacaaatgc 60
catcaggttg tcggttaact ccatgcctgg gatgttcggc agtgcgcctt tgaactgcgt 120
tttatcgaca atccattcgc tgaaggtttc taccgtcact tccagcggat cgttagttgc 180
cgaagccgaa ggcggtacga tgcggtcaac ggcggaatcg acaaagccaa cgtgttcttc 240
tacccacgct ttggcgtctt ccggcagggc gttcatcaca tggcctttca gctgcgtggt 300
accgcgtacc atgttttcac aggcgatgat gttcagcggg gattcattac cttgttcttt 360
acgtttcacc tgccctttgg cgattgccgg agcaatacgt tccagcacaa ccgggccaac 420
ggcggtagtg actaaatcaa cctgagcaat cagatcaacg acatcatca 469

<210> 395
<211> 443
<212> DNA
<213> Pinus radiata

<400> 395
aatcgcgtca cgaatggtct gatgaccggc cagttttccg aggtacgcgg ttatagcatg 60
acccgtgttc agggtgaaga gtttacgttc gacaaatgcc atcaggttgt cggttaactc 120
catgcctggg atgttcggca gtgcgccttt gaactgcgtt ttatcgacaa tccattcgct 180
gaaggtttct accgtcactt ccagcggatc gttagttgcc gaagccgaag gcggtacgat 240
gcggtcaacg gcggaatcga caaagccaac gtgttcttct acccacgctt tggcgtcttc 300
cggcagggcg ttcatcacat ggcctttcag ctgcgtggta ccgcgtacca tgttttcaca 360
ggcgatgatg ttcagcgggg attcattacc ttgttcttta cgtttcacct gccctttggc 420
gattgccgga gcaatacgtt cca 443

<210> 396
<211> 252
<212> DNA
<213> Pinus radiata

<400> 396
tctcgtcgag aatcgcgtca cgaatggtct gatgaccggc cagttttccg aggtacgcgg 60
ttatagcatg acccgtgttc agggtgaaga gtttacgttc gacaaatgcc atcaggttgt 120
cggttaactc catgcctggg atgttcggca gtgcgccttt gaactgcgtt ttatcgacaa 180

tccattcgct gaaggtttct accgtcactt ccagcggatc gttagttgcc gaagccgaag 240
gcggtacgat gc 252

<210> 397
<211> 395
<212> DNA
<213> Pinus radiata

<400> 397
aatcgcgtca cgaatggtct gatgaccggc cagttttccg aggtacgcgg ttatagcatg 60
acccgtgttc agggtgaaga gtttacgttc gacaaatgcc atcaggttgt cggttaactc 120
catgcctggg atgttcggca gtgcgccttt gaactgcgtt ttatcgacaa tccattcgct 180
gaaggtttct accgtcactt ccagcggatc gttagttgcc gaagccgaag gcggtacgat 240
gcggtcaacg gcggaatcga caaagccaac gtgttcttct acccacgctt tggcgtcttc 300
cggcagggcg ttcatcacat ggcctttcag ctgcgtggta cccgcgtacc atgttttcac 360
aggcgatgat gttcagcggg gattcattac cttgt 395

<210> 398
<211> 422
<212> DNA
<213> Pinus radiata

<400> 398
tctcgtcgag aatcgcgtca cgaatggtct gatgaccggc cagttttccg aggtacgcgg 60
ttatagcatg acccgtgttc agggtgaaga gtttacgttc gacaaatgcc atcaggttgt 120
cggttaactc catgcctggg atgttcggca gtgcgccttt gaactgngtt ttatcgacaa 180
tccattcgct gaaggtttct accgtcactt ccagcggatc gttagttgcc gaagccgaag 240
gcggtacgat gcggtcaacg gcggaatcga caaagccaac gtgttcttct acccacgctt 300
tggcgtcttc cggcagggcg ttcatcacat ggcctttcag ctgcgtggta cccgcgtacc 360
atgttttcac aggcgatgat gttcagcggg gattcattac cttgttcttt acgtttcacc 420
tg 422

<210> 399
<211> 305
<212> DNA
<213> Eucalyptus grandis

<400> 399
ccgataagaa gctcatcccc gncaagtcca agttccagac ctacctggga cggncctgga 60
agagttctcg aggaccatca tcatggagtc gtcaatcgag gacttcattg atccggcagg 120
ctttatgcca tgggagggtg atttcgcgct caanaccctg tactatgcgg agtttaacaa 180
caaggggccc ggtgcgaaca tcaacgcccg agtgaagtgg cccggttaca agaagatcaa 240
taagcaggaa gcagccaagt tcaccgctgg gacttttctg gatggggatt ggatcaaggg 300
agcct 305

<210> 400
<211> 372
<212> DNA
<213> Eucalyptus grandis

<400> 400
atcgtctaca acagcaacta cgtcgacggc gtcaacacct tcaagaccgc caccgtcgcc 60
gtcctcggtg agcagttcct cgccaaggac atcgggttcg agaacgacgc aggcgccatc 120
aagcaccagg ccgtggcgct gagggtccag tcggacttct ccgtcttcta caactgccac 180
atggacgggt accaggacac cctctacacc cacgcccacc gccagttcta ccgcgactgc 240
accatctcgg gcaccatcga cttcatcttc ggcgacgcct ccgccatctt ccagaactgc 300
aagatgctcg tccgcaagcc gctggacaac cagcagtgca tcgtcaccgc ccagggncgg 360

aaggagaggc gc 372

<210> 401
<211> 262
<212> DNA
<213> Eucalyptus grandis

<400> 401
gttcttccgg gagtgcgaca tctacgggac tgtcgacttc atcttcggga acgccgccgt 60
cgtgctccag aactgcagcc tctatgcccg caagcccatg cccatgcaga agaacaccat 120
cacggcccag aaccgcaagg acccgaacca gaacacgggc atctcgattc acgcgtgccg 180
gatcctggcc acgtcggacc tcgccgcctc aaacgggagc ttcctctcgt acctcggccg 240
gccctggaag ttgtactcga gg 262

<210> 402
<211> 403
<212> DNA
<213> Eucalyptus grandis

<400> 402
gcccgacgtg gttgtggccc aggacggaag cggcaagtac aagaccatcc gtgaggctct 60
gaacgaggtt cctaagaaga acaacaagac cttcgtcata tacatcaagg aaggagtgta 120
caaagagaaa gtactggtag acaagaagac gaccaatgtc atgattatcg gcgacggccc 180
gacgaagact gtgatcaccg ggagcttgaa ctatgtcgat ggagtccaaa cctgcaacac 240
cgcaacattc actgccatag gaagctactt catagccaag gacatcaagt ttgagaactc 300
ggcaggcgcc gagaagcacc aggccgtggc gctacgcgtc cagtccgaca tgtccgtaat 360
ttacaactgc cacatggacg ccttccagga caccctctac gcg 403

<210> 403
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<212> DNA
<213> Eucalyptus grandis

<400> 403
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actcgagggt tgtgtacatg ttgtcctaca tgggcgatca cattcacccc gaaggtggct 180
ggagtggaac ggagactttg cgctagacac tttgtattac ggagagtaca tgaacgatgg 240
gcccggggca gccgtcggcc tacgtgtgaa atggccgggt ttccgagtca tcacatccac 300
aacagaggca aacaaattca cagtcgcgca gttcatattt ggatcttcat ggttgccgtc 360
caccggggtg gcattcgtgg ctggactatc aacttgaaag ttgaaagt 408

<210> 404
<211> 361
<212> DNA
<213> Eucalyptus grandis

<400> 404
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acgattgcgg aggcgataaa gaaggcgccg gagagcagtg gccggaggat catcatctac 180
gtgcgagccg ggaggtacga ggaggataac ttgaaggtgg ggaagaagaa gacgaacctc 240
atgttcatcg gcgatgggaa gggcagaacg gtcataacgg gcggcaaaag tgtagccgac 300
aagatgacca cgttccacac cgcctccttc gcgggcgagc ggaccggttt cattgcccgc 360
a 361

<210> 405

<211> 227
<212> DNA
<213> Eucalyptus grandis

<400> 405
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cattcacaat caccggcgat ggatttatag cccgagacat cgggttccaa aacacagcgg 120
ggccccaagg tcaacaggct gtcgccctaa ccgtggcctc cgatcacgcg gcattctata 180
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<210> 406
<211> 373
<212> DNA
<213> Eucalyptus grandis

<400> 406
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tcccccagaa agaaaggacc aatactcatt tttcacagcc cttcagtgta agacactcca 120
gtggacttca ccaagtccct ccctgaatca gctcggccac ggtgaacttc ttcgcctctg 180
ctgggctggt gatgacatga taacctggcc acttcacccg cttgctcgtt cccgcgcctg 240
gtcccttgtt catgtactcc ccgtagtaca gagtcttgag ggcatgatcg ccgctccaca 300
ccgaccaccc tgtgggatca atgtgatcac caatgtttga ttgcatcacc acagtcctag 360
agtacaactt cca 373

<210> 407
<211> 190
<212> DNA
<213> Eucalyptus grandis

<400> 407
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gaggcatcta aaggaagcat cccgacgtac ctcgggcggc catggaagat gtactcgagg 120
gttgtgtaca tgttgtccta catgggcgat cacattcacc ccgaagggtg gctggagtgg 180
aacggagact 190

<210> 408
<211> 387
<212> DNA
<213> Eucalyptus grandis

<400> 408
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gaggcatcta aaggaagcat cccgacgtac ctcgggcggc catggaagat gtactcgagg 120
gttgtgtaca tgttgtccta catgggcgat cacattcacc ccgaagggtg gctggagtgg 180
aacggagact ttgcgctaga cactttgtat tacggagagt acatgaacga tgggcctggg 240
gcagccgtcg gcctacgtgt gaaatggcct ggtttccgag tcatcacatc cacaacagag 300
gcaaacaaat tcacagtcgc gcagttcata tttggatctt catggttgcc gtccaccggg 360
gtggcattcg tggctggact atcaact 387

<210> 409
<211> 482
<212> DNA
<213> Eucalyptus grandis

<400> 409
gccgtcgggc ctggggttcg acggcggggt cccttcgggg ctgacggcgg acgcgacggt 60
gtgcaaggac gggggaagcg ggtgctacgc gacggtgcag gccgccgtcg acgccgcgcc 120

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aacggtgagg gtcccgttcg agaagaagaa cgtggtgttc ctgggggacg gcatgggcaa   240
aaccgtcatc accgggtcct ccaacgcggg gcaacctggg gtctccacct acaacaccgc   300
caccgtcgga gtgctcggcg acggattcat ggcaagcggg ctcacgatcc agaacaccgc   360
aggtccggtc acccaccagg cggtggcgtt ccggtcggac agcgatttct cggtcatcga   420
gaactgcgag ttcttgggga accaagacac gctctacgcc cactccctcc ggcagtacta   480
ca                                                                  482
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<210> 410
<211> 424
<212> DNA
<213> Eucalyptus grandis

<400> 410

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gttgtgtaca tgttgtccta catgggcgat cacattcacc ccgaagggtg gctggagtgg   180
aacggagact ttgcgctaga cactttgtat tacggagagt acatgaacga tgggcctggg   240
gcagccgtcg gcctacgtgt gaaatggcct ggtttccgag tcatcacatc cacaacagag   300
gcaaacaaat tcacagtcgc gcagttcata tttggatctt catggttgcc gtccaccggg   360
gtggcattcg tggctggact atcaacttga aagttgaaag tgacatttac agatacgata   420
tgtt                                                                424
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<210> 411
<211> 519
<212> DNA
<213> Eucalyptus grandis

<400> 411

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gaaggtgggg aagaagaaga cgaacctcat gttcatcggc gatgggaagg gcagaacggt   180
cataacgggc ggcaaaagtg tagccgacaa gatgaccacg ttccacaccg cctccttcgc   240
ggcgagcgga gccggtttca ttgcccgcga catgaccttc gagaactacg ccgggccgga   300
gaagcaccag gcggtggctc tccgggtagg agctgaccat ggcgtggtct ataggtgcag   360
catcgttggc tatcaggaca cgctctacgt ccactcgaat cgccagttct tccgtgaatg   420
cgacatctac gggaccgttg acttcatctt tggcaacgca gcccgtggtc atncaaaaga   480
gcaacatcta tgcccggaag cccatggcca agcaaaaga                          519
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<210> 412
<211> 395
<212> DNA
<213> Eucalyptus grandis

<400> 412

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agctcgggcc ctcctccgat ccccagctcg aggatgccct cccttcccca ccggaggcga   120
taaagaaggc gccggagagc agtggccgga ggatcatcat ctacgtgcga accgggaggt   180
acgaggagga taacttgaag gtggggaaga agaagacgaa cctcatgttc atcggcgatg   240
ggaagggcag aacggtcata acgggcggca aaagtgtagc cgacaagatg accacgttcc   300
acaccgcctc cttcgcggcg agcggagccg gtttcattgc ccgcgacatg accttcgaga   360
actacgccgg gccggagaag caccaggcgg tggct                              395
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<210> 413
<211> 499
<212> DNA
<213> Eucalyptus grandis

<400> 413
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ccatatttgt ttctacttca tctcctgaag gacgaagacc agatgttctg gagtccttga 180
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aagaggcgat cgcagctgct cctagcaaag cccagacccg gtacgttatt tatgtgaaga 360
aaggcacata caaggagaat gtggaggtgg caaagacaaa gacaaacatc atgcttgttg 420
gcgacggcat ggattcaact gtgatcactg caagcctcaa cgtcattgac ggtgcgacaa 480
cattcaattc cgcactggt 499

<210> 414
<211> 497
<212> DNA
<213> Eucalyptus grandis

<400> 414
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gacgggactg ggaactacac gacgatctcg gaggcagtgg cggcggcgcc ggagaagagc 120
agcaagcggt acgtgataag gataaagacc ggggtgtaca gagagaacgt gcaggtgccg 180
aagaagaaga ccaacctgac tttcatcggc gacgggcgga ccaccaccat catcaccggc 240
gaccggagcg tgaagggcgg cttcaccacc ttcgagtccg ccactgtcgc ggtgcttggc 300
gagcgattct tggccaaaaa cataaccttc cagaacaccg ccggcccttc aaaccaccag 360
gccgttgccc tccgtgttgg tgccgatcta tctgccattt acgaatgcga catcctcgcc 420
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ggcacagtcg acttcat 497

<210> 415
<211> 295
<212> DNA
<213> Eucalyptus grandis

<400> 415
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ggatcatcat ctacgtgcga gccgggaggt acgaggagga taacttgaag gtggggaaga 120
agaagacgaa cctcatgttc atcggcgatg ggaagggcag aacggtcata acgggcggca 180
aaagtgtagc cgacaagatg accacgttcc acaccgcctc cttcgcggcg agcggagccg 240
gtttcattgc ccgcgacatg accttcgaga actacgccgg gccggagaag cacca 295

<210> 416
<211> 433
<212> DNA
<213> Eucalyptus grandis

<400> 416
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ccatggccgc ccgaggtacg tcgggatgct tcctttagat gcctcgagat ctggagcggc 120
gacgatctgg caagcatgga tcgaaatgcc ggtgttctgg ttggggtcct tgcggttctg 180
ggccgtgatg gtgttctttt gcttggccat gggcttccgg gcatagatgt tgctcttttg 240
gatgaccacg gctgcgttgc caaagatgaa gtcaacggtc ccgtagatgt cgcattcacg 300
gaagaactgg cgattcgagt ggacgtagag cgtgtcctga tagccaacga tgctgcacct 360
atagaccacg ccatggtcag ctcctacccg gagagccacc gcctggtgct tctccggccc 420
ggcgtagttc tcg 433

<210> 417
<211> 414

<212> DNA
<213> Eucalyptus grandis

<400> 417
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gcgcccgttg gcgaggatca cggtataggc tgagttccca gactttcgca acaccagctc 120
acagttctgg aagacggcag ctgcgttccc aaagataaaa tctatggtgc catagatgtc 180
gcactcacgg tagaactggc ggagtacgag cgcgtacaat gtgtcctggt agcccgcgat 240
gctgcaccta tagaatgccg cgtgatcgga ggccacggnt agggcgacag cttgttgacc 300
ttggggcccc gctgtgtttt ggaacccgat gtctngggct ataaatccat cgccggtgat 360
tgtgaatgta gcagagccgc gcaaggaaga cccccagcca cactatcatc accg 414

<210> 418
<211> 382
<212> DNA
<213> Eucalyptus grandis

<400> 418
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agtatccaga gtggctaggg gagagagaga gggagctgct ggacatgccg gcggcggagg 120
tacaggcgga catagtggtg gcgaaggacg gagcgagcgg gacgtacaag acgattgcgg 180
aggcgataaa gaaggcgccg gagagcagtg gccggaggat catcatctac gtgcgagccg 240
ggaggtacga ggaggataac ttgaaggtgg ggaagaagaa gacgaacctc atgttcatcg 300
gcgatgggaa gggcagaacg gtcataacgg gcggcaaaag tgtagccgac aagatgacca 360
cgttccacac cgcctccttc tc 382

<210> 419
<211> 247
<212> DNA
<213> Eucalyptus grandis

<400> 419
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tggtcaccgc ccagggccgn gatgatccca accagaacac aggtatagtg atccaaaagt 120
gcaggatcgg cgcgacatca natctcttgg cagtgaaagg gagcttccaa acttatctgg 180
gaaggccatg gaagatgtac tcgaggacgg tgataatgca gaccgccata agcgacgtga 240
tcaaccc 247

<210> 420
<211> 471
<212> DNA
<213> Eucalyptus grandis

<400> 420
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taggagctga ccatggcgtg gtctataggt gcagcatcgt tggctatcag gacacgctct 120
acgtccactc gaatcgccag ttcttccgtg aatgcgacat ctacgggacc gttgacttca 180
tctttggcaa cgcagccgtg gtcatccaaa agagcaacat ctatgcccgg aagcccatgg 240
ccaagcaaaa gaacaccatc acggcccaga accgcaagga ccccaaccag aacaccggca 300
tttcgatcca tgcttgccag atcgtcgccg ctccagatct cgaggcatct aaaggaagca 360
tcccgacgta cctcgggcgg ccatggaaga tgtactcgag ggtcgtgtac atgttgtcct 420
acatgggcga tcacattcac cccgaagggt ggctggagtg gaacggagac t 471

<210> 421
<211> 371
<212> DNA
<213> Eucalyptus grandis

<400> 421
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aaagtgtagc cgacaagatg accacgttcc acaccgcctc cttcgcggcg agcggagccg 120
gtttcattgc ccgcgacatg accttcgaga actacgccgg gccggagaag caccaggcgg 180
tggctctccg ggtaggagct gaccatggag tggtctatag gtgcagcatc gttggctatc 240
aggacacgct ctacgtccac tcgaatcgcc agttcttccg tgaatgcgac atctacggga 300
ccgttgactt catctttggc aacgcagccg tggtcatcca aaagagcaac atctatgccc 360
ggaagcccat g 371

<210> 422
<211> 349
<212> DNA
<213> Eucalyptus grandis

<400> 422
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gcgacgggaa gacgaagacc atcgtcaccg gcagcaagaa cttcatcgac ggcactccga 120
ctttcagcac ggcgaccttc gctgttgcgg gtaaagggtt tattgcgaga gacatgatgt 180
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tctcggtgat ataccgctgc gcctttgatg cgtaccagga cacgctctat gcgcactcga 300
accgccagtt ctaccgcgac tgcgacatca cgggcacgat cgacttcat 349

<210> 423
<211> 357
<212> DNA
<213> Eucalyptus grandis

<400> 423
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ggaacgggac gtgcaagacg atctcggagg ccatcaagaa ggcgccggac tacggtaccc 120
gccggtttat catatacgtg cgagccggaa ggtacgagga agataatctg aaggtgggga 180
ggaagaagac gaacgtgatg ttcgtagggg acgggaagag caacaccatc atctccggcg 240
gcaagagcat cttcgacaac atgacgacgt tccacaccgc gtccttcgct gccaccggag 300
ccgggttcat cgctcgggac atccgttcga gaactgggct gggcccgcca agcacca 357

<210> 424
<211> 346
<212> DNA
<213> Eucalyptus grandis

<400> 424
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atgccggcgg cggaggtaca ggcggacata gtggtggcga aggacggagc gaacgggacg 120
tacaagacga tcgcggaggc gataaagaag gcgccggaga gcagtggccg gaggatcatc 180
atctacgtgc aagccgggag gtacgaagag gataacttga aggtggggaa gaagaagacg 240
aacctcatgt tcatcggcga tgggaagggc aaaacggtca taacgggcgg caaaagtgta 300
gccgacaaga tgaccacgtt ccacaccgcc tccttcgcgg cgagcg 346

<210> 425
<211> 577
<212> DNA
<213> Eucalyptus grandis

<400> 425
gcgacggccg gaccaccacc atcatcaccg gcgaccggac gtgaagggcg gcttcaccac 60
cttcgagtcc gccaccgtcg cggtggttgg cgagcgattc ttggccaaaa gcataacctt 120

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ccagaacacc gntggccctt caaaccacca ggccgttgcg ctccgggttg gcgccgatct    180
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ccgccaattc tttgtcaagt gcttaattgc cggcacagtc gacttcatct ttggtaacgc    300
agctgtcgtc atccaagact gtgacatcca tgcccgcaag ccaaaccctg gccaaaagaa    360
catggttact gctcaaggac gaattgaccc gaaccaaaac acgggaatcg tgatccaaaa    420
atgcaggatt gctgagacca acgatctccg atcagtgaag agcagtttcc caacgtacct    480
cggtcgtcca tggaaggagt actcgaggac agtgattatg caatcatcga tctcggacgt    540
aatcgacccg gtgggttggc acgagtggag tgggacc                             577
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<210> 426
<211> 283
<212> DNA
<213> Eucalyptus grandis

<400> 426
aaagaccggg gtgtacagag agaacgtgca ggtgccgaag aagaagacca acctgacttt     60
catcggcgac gggcggacca ccaccatcat caccggcgac cggagcgtga agggcggctt    120
caccaccttc gagtccgcca ctgtcgcggt gcttggcgag cgattcttgg ccaaaaacat    180
aaccttccag aacaccgccg gcccttcaaa ccaccaggcc gttgccctcc gtgttggtgc    240
cgatctatct gccatttacg aatgcgacat cctcgcctac cag                      283

<210> 427
<211> 345
<212> DNA
<213> Eucalyptus grandis

<400> 427
ccaccgtcgg agtgcttggc gacggattca tggcaaccgg gctcacgatc cagaacaccg     60
cgggtccaga cgcccaccag gcggtggcat tccggtcgga cagcgatttc tcggtcatcg    120
agaactgcga gttcctggga aaccaggaca cgctctatgc ccacgccctc cggcagtact    180
acaagtcctg ccacatcgag ggcaatgtgg acttcatctt tgggaactcg gcctcctact    240
tccaggactg ccagatcctg gtccgccccc ggcaggtcaa gcccgagaag ggcgagagca    300
atgctgtcac agcccatggc cggaccgacc ccgcgcagtc gacag                    345

<210> 428
<211> 478
<212> DNA
<213> Eucalyptus grandis

<400> 428
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ctaaatcttc gatcaagcct attctcagcg acttgatatc gagggcaaga acttctctag    120
ccatatttgt ttctacttca tctcctgaag gacgaagacc agatgttctg gagtccttga    180
tcggtgattt cccatcatgg gtcacacgaa aagatcatcg tctcctgcaa tctctggtga    240
acgcagttaa tgccgacgtg gtggtggcga aggacggaac tgggaagttc aagacagtga    300
aagaggcgat cgcagctgct cctagcaaag cccagacccg gtacgttatt tatgtgaaga    360
aaggcacata caaggagaat gtggaggtgg caaagacaaa gacaaacatc atgcttgttg    420
gcgacggcat ggattcaact gtgatcactg gcagcctcaa cgtcattgac ggtgcgac      478

<210> 429
<211> 335
<212> DNA
<213> Eucalyptus grandis

<400> 429
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cttacagaaa ctcccccaga aagaaaggac caatactcat ttttcacagc ccttcagtgt    120
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aagacactcc agtggacttc aaccaagtcc ctccctgaat cagctcggcc acggngaact 180
tcttcgcctc tgctgggctg gtgatgacat gataacctgg ccacttcacc cgcttgctcg 240
ttcccgcgcc tggtcccttg ttcatgtact ccccgtagta canagtcttg agggcatgat 300
cgccgctcca caccgaccac cctgtgggat caatg 335

<210> 430
<211> 361
<212> DNA
<213> Eucalyptus grandis

<400> 430
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aagacactcc agtggacttc aaccaagtcc ctccctgaat cagctcggcc acggngaact 180
tcttcgcctc tgctgggctg gtgatgacat gataacctgg ccacttcacc cgcttgctcg 240
ttcccgcgcc tggtcccttg ttcatgtact ccccgtagta cagagtcttg agggcatgat 300
cgccgctcca caccgaccac cctgtgggat caatgtgatc accaatgttt gattgcatca 360
c 361

<210> 431
<211> 368
<212> DNA
<213> Eucalyptus grandis

<400> 431
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aacttacaga aactccccca gaaagaaagg accaatactc atttttcaca gcccttcagt 120
gtaagacact ccagtggact tcaaccaagt ccctccctga atcagctcgg ccacggtgaa 180
cttcttcgcc tctgctgggc tggtgatgac atgataacct ggccacttca cccgcttgct 240
cgttcccgcg cctggtccct tgttcatgta ctccccgtag tacagagtct tgagggcatg 300
atcgccgctc cacaccgacc accctgtggg atcaatgtga tcaccaatgt ttgattgcat 360
cccacagt 368

<210> 432
<211> 324
<212> DNA
<213> Eucalyptus grandis

<400> 432
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gttgtgtaca tgttgtccta catgggcgat cacattcacc ccgaagggtg gctggagtgg 180
aacggagact ttgcgctaga cactttgtat tacggagagt acatgaacga tgggcctggg 240
gcagccgtcg gcctacgtgt gaaatggcct ggtttccgag tcatcacatc cacaacagag 300
gcaaacaaat tcacagtcgc gcag 324

<210> 433
<211> 460
<212> DNA
<213> Eucalyptus grandis

<400> 433
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ggacatgccg gcggcggagg tacaggcgga catagtggtg gcgaaggacg gagcgagcgg 120
gacgtacaag acgattgcgg aggcgataaa gaaggcgccg gagagcagtg gccggaggat 180
catcatctac gtgcgagccg ggaggtacga ggaggataac ttgaaggtgg ggaagaagaa 240
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tgtagccgac aagatgacca cgttccacac cgcctccttc ggtaaatttc tgtgctcata 360
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tttgtctaaa taatttattt tttacgaaac aaatcgaacc 460

<210> 434
<211> 344
<212> DNA
<213> Eucalyptus grandis

<400> 434
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cccagacccg gtacgttatt tatgtgaaga aaggcacata caaggagaat gtggaggtgg 120
caaagacaaa gacaaacatc atgcttgttg gcgacggcat ggattcaact gtgatcactg 180
gcagcctcaa cgtcattgac ggtgcgacaa cattcaattc cgcaactgtt gctgtgaatg 240
gcgatgggtt catagcccag gacatatggt tccagaacac tgccgggccg cagaaacacc 300
aggccgtcgc actccgtgtc agtgcagaca agtcagtcat caac 344

<210> 435
<211> 295
<212> DNA
<213> Pinus radiata

<400> 435
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accctttacg cccattccct tcgtcagttt tacagagaat gcaacatcta tggcaccgta 180
gatttcatct tcggcaactc cgccgtcgtt tttcaggatt gcaatttgct ggcgcggaga 240
cccctggaga atcagacgat tctttacacc gctcagggca ggcaggaccc caatg 295

<210> 436
<211> 332
<212> DNA
<213> Pinus radiata

<400> 436
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gttaccaaga cacactttat gttcactctc tgaggcagtt ttacagagaa tgtgacgtgt 180
tcggaacagt ggacttcatt tttggcaatg cagccgtggt tttacaggag tgtaacattt 240
atgctcgaca aggcatgccc aatcaagtga atgtaatcac tgcccaagga aggaatcatc 300
cttatcaaaa taccggcatc tcaatacata at 332

<210> 437
<211> 301
<212> DNA
<213> Pinus radiata

<400> 437
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ggagaacgtg gaggtgggta aaacgaagac taatatcatg ttgattggag aaggcatgga 120
ggccacaatc gttacaggga gcagaaatgt gatagacgga tccaccactt tcaattcagc 180
cacattcgct gctgtaggga agggatttat ggcacaagac atggcgttcg tcaacacagc 240
aggcccggac aaacatcagg cggtggctct tcgagtaggt cagatcaatc agtgttatat 300
c 301

<210> 438
<211> 242

<212> DNA
<213> Pinus radiata

<400> 438
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gattggagaa ggcatggagg ccacaatcgt tacagggagc agaaatgtga tagacggatc 120
caccactttc aattcagcca cattcgctgc tgtagggaag ggatttatgg cacaagacat 180
ggcgttcgtc aacacagcag gcccggacaa acatcaggcg gtggctcttc gagtaggatc 240
ag 242

<210> 439
<211> 255
<212> DNA
<213> Pinus radiata

<400> 439
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aactggcctc gcttgagcta ttaatcactc gataccccgc ccatttgacc cgatttgtag 120
tgcccgcacc agggccgcgg ttcatgtatt ccccatagta tagggtgctg agagcgaagg 180
atccattcca ttcgagccaa ccggcaggtt gaatcaggtc gcccagaaag gactgcatga 240
agacagtgcg agagt 255

<210> 440
<211> 362
<212> DNA
<213> Pinus radiata

<400> 440
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tgagaacttg tgattacccg atacccggcc catttcacgc ggttagcagt tgctgctcct 120
gggcctgtat tcatgtattc tccataatac aaagtttgca atgcaaaact tccattccat 180
tccagccagc ccgcaggctg aataacatcg tctagatagg actgcatgta aaccgttcgg 240
gaatactcct tccacggcct ccccagatat gttgggaatg agcttttcac cggaacaagg 300
tcggaatcgg gagtgatctt gcagttgtga atggaagttc ctgtgttctg gttcggatca 360
gt 362

<210> 441
<211> 286
<212> DNA
<213> Pinus radiata

<400> 441
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cgaaatgtga aggacaattt cacaaccttt cgttctgcaa ctgttgctgt gactggaaat 120
ggattcatcg ctcgcgacat gaccttcgag aacacggcag gacccgcgaa gcaccaggcg 180
gtggccctgc gtgtgggatc agatctttcg gctttctatc gatgcagctt caagggttac 240
caggacaccc tttacgccca ttcccttcgt caagttttta cagaga 286

<210> 442
<211> 302
<212> DNA
<213> Pinus radiata

<400> 442
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ggagttgcac aagaagaaaa ctaatatcat gttcgttgga gatggtatgg atgtcacagt 120
ggtgaccgga aaccgaaatg tgaaggacaa tttcacaacc tttcgttctg caactgttgc 180

tgtgactgga aatggattca tcgctcgcga catgaccttc gagaacacgg caggacccgc 240
gaagcaccag gcggtggccc tgcgtgtggg atcagatctt tcggctttct atcgatgcag 300
ct 302

<210> 443
<211> 466
<212> DNA
<213> Pinus radiata

<400> 443
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cgaactatcg tcaccggatc attgtctgcc cagattcccg gcgtcggcac acacggctct 120
gcaactgtcg gggtgaacgc ggacggtttt gttgcgcgag acattgcgtt cgagaatact 180
gcggggccgg agatgcatca ggctgttgcc ctcagagtcg atagcgatct ctcagcattc 240
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tatcggaatt gcaggatcga aggcaacgtc gacttcatat ttggaaacgc agcggccatc 360
ttccacaact gctccattct cgtccgccct cgccaggtgc cgtctaatct ttccgaagcg 420
aaccccataa ctgcccacgg gcgattggat ccgggtcaga ctactg 466

<210> 444
<211> 345
<212> DNA
<213> Pinus radiata

<400> 444
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aaaaattgaa agcgaactac agacacagac gaacttcttc aaaagtttgg cgaagtcgct 120
aatttatcaa tccgtcgatg tagtcgatgc cagtggactg caaccaggaa tttccttgta 180
tgaattctcc cactgtaaat ttgctcgcct cttgagaact tttgatcacc cgatacccag 240
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acaaagtttt caaagcaaaa gctccatccc attccagcca gcccg 345

<210> 445
<211> 183
<212> DNA
<213> Pinus radiata

<400> 445
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tatttgggaa tgccgcagtg gtgtttcaga gctgcaatct gatgcccagg aaacccggtg 120
caaatcagaa aaatgccatc acagcacagg gcagaactga tccgaaccaa aacacaggaa 180
ctt 183

<210> 446
<211> 264
<212> DNA
<213> Pinus radiata

<400> 446
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cctgatgttt gtccgggcct gctgtgttga cgaacgccat gtcttgtgcc ataaatccct 120
tccctacagc agcgaatgtg gctgaattga aagtggtgga tccgtctatc acatttctgc 180
tccctgtaac gattgtggcc tccatgcctt ctccaatcaa catgatatta gtcttctttt 240
tacccacctc cacgttctcc ttgt 264

<210> 447
<211> 417

<212> DNA
<213> Pinus radiata

<400> 447
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atgggcgtat agggtgtcct ggtaaccctt gaagctgcaa cgatagaaag ccgagagatc 120
tgatcccaca cgcagggcca ccgcctggtg cttcgcgggt cctgccgtgt tctcgaaggt 180
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gaacatgata ttagttttct tcttgtgcaa ctccacattc tctgcataaa ctcctgcttt 360
tatatgaatt acgtatctcg tctggctctt ctccggagcc ttctccactg cctctgt 417

<210> 448
<211> 404
<212> DNA
<213> Pinus radiata

<400> 448
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tgcagagcag agaaaagaaa gcccttaatt tattggccac ctggcttgca atattctatt 120
gcattttaga gtacagcaga ataatataca cgtcagcctt aatttcagaa aaataaataa 180
actacgtgag cagccctcca ataaaaacga tcccagtgga tggcaaccat ttagcaccag 240
agatgaactg ggccaccgtg aatggataaa cttcctgcgc cgctttgaaa atcctgtaac 300
caggccacgt cacccgcctc gcaagccctg cgccggggcc actgttcata tattccccat 360
aaaataaggt atccagtgcg aagtctccga accactccaa ccat 404

<210> 449
<211> 173
<212> DNA
<213> Pinus radiata

<400> 449
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gcgccagggc cgcggttcat gtattcccca taatagaggg tactcagtgc gaaggttcca 120
ttccattcga gccaacccgc tggctgaatc atgtcgccaa gaaacgattg cat 173

<210> 450
<211> 398
<212> DNA
<213> Pinus radiata

<400> 450
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ggacacactg tacgtacatt ctctccgcca attttacaga gaatgcgaca tctacggcac 120
agtggacttc atctttggca acgcagccgt ggtgttgcag aagtgcacca tgttcgccag 180
aaaacccctg cccaactcca agatcacggt gacggctcag ggcaggaagg accccaacca 240
gaacaccggc atctccatcc acgactgcag agtgacggcg gcggcggatc ttgctcccgt 300
caagggcctc tatcgcgctt acctcgggag gccctggaaa ttatactctc gcacggtata 360
cctgcaaact tttttggatg atattattga ccctgccg 398

<210> 451
<211> 404
<212> DNA
<213> Pinus radiata

<400> 451
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atgggcgtat agggtgtcct ggtaaccctt gaagctgcaa cgatagaaag ccgagagatc 120
tgatcccaca cgcagggcca ccgcctggtg cttcgcgggt cctgccgtgt tctcgaaggt 180
catgtcgcga gcgatgaatc catttccagt cacagcaaca gttgcagaac gaaaggttgt 240
gaaattgtcc ttcacatttc ggtttccggt caccactgtg acatccatac catctccaac 300
gaacatgata ttagttttct tcttgtgcaa ctccacattc tctgcataaa ctcctgcttt 360
tatatgaatt acgtatctcg tctggctctt ctccggagcc ttct 404

<210> 452
<211> 394
<212> DNA
<213> Pinus radiata

<400> 452
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atgggcgtat agggtgtcct ggtaaccctt gaagctgcaa cgatagaaag ccgagagatc 120
tgatcccaca cgcagggcca ccgcctggtg cttcgcgggt cctgccgtgt tctcgaaggt 180
catgtcgcga gcgatgaatc catttccagt cacagcaaca gttgcagaac gaaaggttgt 240
gaaattgtcc ttcacatttc ggtttccggt caccactgtg acatccatac catctccaac 300
gaacatgata ttagttttct tcttgtgcaa ctccacattc tctgcataaa ctcctgcttt 360
tatatgaatt acgtatctcg tctggctctt ctcc 394

<210> 453
<211> 428
<212> DNA
<213> Pinus radiata

<400> 453
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tgcagagcag agaaaagaaa gcccttaatt tattggccac ctggcttgca atattctatt 120
gcattttaga gtacagcaga ataatataca cgtcagcctt aatttcagaa aaataaataa 180
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agatgaactg ggccaccgtg aatggataaa cttcctgcgc cgctttgaaa atcctgtaac 300
caggccacgt cacccgcctc gcaagccctg cgccggggcc actgttcata tattccccat 360
aaaataaggt atccagtgcg aagtctccga accctccaac catccggcag ggtcaataat 420
atcatcct 428

<210> 454
<211> 329
<212> DNA
<213> Pinus radiata

<400> 454
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ttcccaacat atctggggag gccgtggaag gagtattccc gaacggttta catgcagtcc 180
tatctagacg atgttattca gcctgcgggc tggctggaat ggaatggaag ttttgcattg 240
caaactttgt attatggaga atacatgaat acaggcccag gagcagcaac tgctaaccgc 300
gtgaaatggg ccgggtatcg ggtaatcac 329

<210> 455
<211> 358
<212> DNA
<213> Pinus radiata

<400> 455
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aatttcaaaa cgatttcaca agccatagct gcggccccag agaaaagtgg taagagatat 120

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gtgatcaagg tgaagaaggg aacgtacaag gagaacgtgg aggtgggtaa aacgaagact     180
aatatcatgt tgattggaga aggcatggag gccacaatcg ttacagggag cagaaatgtg     240
atagacggat ccaccacttt caattcagcc acattcgctg ctgtagggaa gggatttatg     300
gcacaagaca tggcgttcgt caacacagca ggcccggaca aacatcaggc ggtggctc       358

      &lt;210&gt; 456
      &lt;211&gt; 195
      &lt;212&gt; DNA
      &lt;213&gt; Pinus radiata

      &lt;400&gt; 456
cgtggaggtg ggtaaaacga agactaatat catgttgatt ggagaaggca tggaggccac      60
aatcgttaca gggagcagaa atgtgataga cggatccacc actttcaatt cagccacatt     120
cgctgctgta gggaagggat ttatggcaca agacatggcg ttcgtcaaca cagcaggccc     180
ggacaaacat caggc                                                      195

      &lt;210&gt; 457
      &lt;211&gt; 405
      &lt;212&gt; DNA
      &lt;213&gt; Pinus radiata

      &lt;400&gt; 457
ttcgcggccg cgtcgacgta attctctggc aatagcaaag ctggcgcagg agtcagtaat      60
gcccgatcca tctcccgaga tacgcctccc gtccgattcc atcaaggatg attttccttc     120
atggctatct gcaggagatc ggaggctcct acgatcctct ccaaacaacg tagtgccaaa     180
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gaacgtggag gtgggtaaaa cgaagactaa tatcatgttg attggagaag gcatggaggc     360
cacaatcgtt acagggagca gaaatgtgat agacggatcc accac                     405

      &lt;210&gt; 458
      &lt;211&gt; 326
      &lt;212&gt; DNA
      &lt;213&gt; Pinus radiata

      &lt;400&gt; 458
cgtggaacat ggatggccta caagacactc gacagcaaac gaaacatagt caaaacatta      60
gcgaagcgac gtcactagtc tgttaatccg tccacataat cgacaccggt ggactgcagc     120
catgaatctc cttgtatgaa ttctccaaca gtaaacttgc tcgcctcttg agaacttgtg     180
attacccgat acccggccca tttcacgcgg ttagcagttg ctgctcctgg gcctgtattc     240
atgtattctc cataatacaa agtttgcaat gcaaaacttc cattccattc cagccagccc     300
gcaggctgaa taacatcgtc tagata                                          326

      &lt;210&gt; 459
      &lt;211&gt; 360
      &lt;212&gt; DNA
      &lt;213&gt; Pinus radiata

      &lt;400&gt; 459
tcgacctacg atcctctcca aacaacgtag tgccaaacgt gatcgtggct aaggatggct      60
ctggaaattt caaaacgatt tcacaagcca tagctgcggc cccagagaaa agtggtaaga     120
gatatgtgat caaggtgaag aagggaacgt acaaggagaa cgtggaggtg ggtaaaacga     180
agactaatat catgttgatt ggagaaggca tggaggccac aatcgttaca gggagcagaa     240
tgtgatagac ggatcnccac tttcaattca gccacattcg ctgctgtagg gaagggattt     300
atggcacaag acatggcgtt cgtcaacaca gcaggcccgg acaaacatca ggcggtggct     360

      &lt;210&gt; 460
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<211> 438
<212> DNA
<213> Pinus radiata

<400> 460
cgtggaacat ggatggccta caagacactc gacagcaaac gaaacatagt caaaacatta 60
gcgaagcgac gtcactagtc tgttaatccg tccacataat cgacaccggt ggactgcagc 120
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cacggcctcc ccagatatgt tgggaatgag cttttcaccg gaacaaggtc ggcatcggga 420
gtgatcttgc agttgtga 438

<210> 461
<211> 380
<212> DNA
<213> Pinus radiata

<400> 461
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gaaattgtcc ttcacatttc ggtttccggt caccactgtg acatccatac catctccaac 300
gaacatgata ttaagttttc ttcttgtgca actccacatt ctctgcataa actcctgctt 360
tatatgaata cgtatctcgt 380

<210> 462
<211> 439
<212> DNA
<213> Pinus radiata

<400> 462
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gaacatgata ttagttttct tcttgtgcaa ctccacattc tctgcataaa ctcctgcttt 360
tatatgaatt acgtatctcg tctggctctt ctccggagcc ttctccactg cctctgtaat 420
gttcgtgtaa tttccactg 439

<210> 463
<211> 441
<212> DNA
<213> Pinus radiata

<400> 463
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canaacacag ccccggttcc tctgccgggg gcggtgggca gacaagcagt ggccttgaga 240
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tatgaccacg ctggccgcca ttatttcaaa gactgttata tcgaaggctc cgtcgatttc 360
atcttcggga acggcctctc cctctacgag gggtgcagcc tgcatgggat ttccgatacc 420
tacggcgcgg tgacagcgca g 441

<210> 464
<211> 481
<212> DNA
<213> Pinus radiata

<400> 464
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t 481

<210> 465
<211> 505
<212> DNA
<213> Pinus radiata

<400> 465
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cccttcaggg tcatgattat catgtacaga caaacaactt tacagtccca tcgtctcctc 120
caacaaaaag gcgacgcctt ttggcagagg caggggaaga aatgaacaat gctcttcgga 180
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gaaaaactat tgtagcagca ggcaa 505

<210> 466
<211> 361
<212> DNA
<213> Pinus radiata

<400> 466
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aagagatacg tgatcaaggt gaagaagggg acgtacaagg agaacgtgga agtgggcaaa 180
aagaagacaa atattatgct gatcgganaa ggcatggaag ccacgatcgt tacagggagc 240
agaaatgttg tagacggttc caccactttc aattcctcta cactagctgc tgtagggaag 300
gggtttatgg cacaagacat ggcgttcgtc aacaccgcag gtccagataa gcatcaagcg 360
g 361

<210> 467
<211> 402
<212> DNA
<213> Pinus radiata

<400> 467
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caggagatcg gaggctccta cgctcctttc caaacgacat cgtggctgac gtgatcgtgg 120
ctcaggatgg ctctggaaaa ttcaaaacaa ttacagaagc catagctgcg gccccggaga 180
aaagctctaa gagatacgtg atcaaggtga agaaggggac gtacaaggag aacgtggaag 240

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tgggcaaaaa gaagacaaat attatgctga tcggagaagg catggaagcc acgatcgtta    300
cagggagcag aaatgttgta gacggttcca ccactttcaa ttcctctaca ctagctgctg    360
tagggaaggg gtttatggca caagacatgg cgttcgtcaa ca                        402
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<210> 468
<211> 397
<212> DNA
<213> Pinus radiata

<400> 468

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aagctgtgaa cagtgcgccg gactactcgg aaaagaaatt tgtgatcaag atacaggccg    120
gggtttacgg ggaaacggtt cgaatccccc gcagtaagac gaatctcgtg tttgtgggcg    180
ccggtatgga taaaacggtg atcaccggtt ctgcatatgt gccgtctctg cccggcccgc    240
tcacaattta cgatgtcgcc acggttggag tgaatgggga cggcttcata gcccgtgaca    300
taacattccg aaacacattt caggggccac agactcatca agccgtggcc ctgagagtag    360
acagcgattt ttctgccttc tacagctgcg ctttcga                             397
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<210> 469
<211> 349
<212> DNA
<213> Pinus radiata

<400> 469

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gcaggacccg cgaagcacca ggcggtggcc ctgcgtgtgg gatcagatct ctnggctttc     60
tatcgntgca gcttcaaggg ttaccaggac accctatacg cccattccct tcgtcagttt    120
tacagagaat gcaacatcta tggcaccgta natttcatct tcggcaactc cgccgtcgtt    180
tttcaggatt gcaatttgct ggcgcggaga cccctggaga atcagaagat tctttacacc    240
gctcacggca ggcaggaccc caatgagaac actggaattt ccattcagaa ctgtaatgtg    300
accgcagccc cagacctggc tccagtgaag agctcgttcg atgcatatc                349
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<210> 470
<211> 375
<212> DNA
<213> Pinus radiata

<400> 470

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cggaggctcc tacgctcctt tccaaacgac atcgtggctg acgtgatcgt ggctcaggat     60
ggctctggaa aattcaaaac aattacagaa gccatagctg cggcccccgga gaaaagctct    120
aagagatacg tgatcaaggt gaagaagggg acgtacaagg agaacgtgga agtgggcaaa    180
aagaagacaa atattatgct gatcggagaa ggcatggaag ccacgatcgt tacagggagc    240
agaaatgttg tagacggttc caccactttc aattcctcta cactagctgc tgtagggaag    300
gggtttatgg cacaagacat ggcgttcgtc aacaccgcag gtccagataa gcatcaagcg    360
gtggctcttc gtgta                                                     375
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<210> 471
<211> 367
<212> DNA
<213> Pinus radiata

<400> 471

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aagctgtgaa cagtgcgccg gactactcgg aaaagaaatt tgtgatcaag atacaggccg    120
gggtttacgg ggaaacggtt cgaatccccc gcagtaagac gaatctcgtg tttgtgggcg    180
ccggtatgga taaaacggtg atcaccggtt ctgcatatgt gccgtctctg cccggcccgc    240
tcacaattta cgatgtcgcc acggttggag tgaatgggga cggcttcata gcccgtgaca    300
taacattccg aaacacattt caggggccac agactcatca agccgtggcc ctgagagtag    360
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acagcga 367

<210> 472
<211> 446
<212> DNA
<213> Pinus radiata

<400> 472
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ggctctggaa aattcaaaac aattacagaa gccatagctg cggccccgga gaaaagctct 120
aagagatacg tgatcaaggt gaagaagggg acgtacaagg agaacgtgga agtgggcaaa 180
aagaagacaa atattatgct gatcggagaa ggcatggaag ccacgatcgt tacagggagc 240
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gggtttatgg cacaagacat ggcgttcgtn aacaccgcag gtccagataa gcatcaagcg 360
gtggctcttc gtgtaggatc agaccaatca gtgttatatc gctgcaagat tgcagcgtac 420
caagacacat tgtacgcgca ttctct 446

<210> 473
<211> 345
<212> DNA
<213> Pinus radiata

<400> 473
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agaaacatta cgtttcagaa cacagccccg gttcctctgc cgggggcggt gggcagacaa 180
gcagtggcct tgagaatcac gggagacacg tcgtccttct tcgggtgcag cttcttgggc 240
gcgcaggaca ctttgtatga ccacgctggc cgccattatt tcaaagactg ttatatcgaa 300
ggctccgtcg atttcatctt cgggaacggc ctctccctct acgag 345

<210> 474
<211> 268
<212> DNA
<213> Pinus radiata

<400> 474
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tgtgaaggac aatttcacaa cctttcgttc tgcgactgtt gctgtgactg gaaacggatt 120
catcgctcgc gacatgacct tcgagaacac ggcaggaccc gcgaagcacc aggcggtggc 180
cctgcgtgtg ggatcagatc tctcggcttt ctatcgatgc agcttcaagg gttaccagga 240
cacccttac gcccattccc ttcgtcag 268

<210> 475
<211> 316
<212> DNA
<213> Pinus radiata

<400> 475
gccagacgag atacgtaatt catataaaag caggagttta tgcagagaat gtggagttgc 60
acaagaagaa aactaatatc atgttcgttg gagatggtat ggatgtcaca gtggtgaccg 120
gaaaccgaaa tgtgaaggac aatttcacaa cctttcgttc tgcgactgtt gctgtgactg 180
gaaacggatt catcgctcgc gacatgacct tcgagaacac ggcaggaccc gcgaagcacc 240
aggcggtggc cctgcgtgtg ggatcagatc tctcggcttt ctatcgatgc agcttcaagg 300
gttaccagga caccct 316

<210> 476
<211> 440

<212> DNA
<213> Pinus radiata

<400> 476
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ggagttgcac ccgacgaaaa caaatatcat gttcattgga gatggcatgg atgttacagt 120
ggtgaccgga aaccgaaatg tgaaggacaa atttacaacc tatcgttctg caactgttgc 180
tgtgactgga aacggattca tcgctcgcga catgaccttc gagaacacgg caggacccac 240
gaagcaccag gcggtggccc tgcgtgtggg atcagatctc tcggccttct ataagtgcaa 300
cttcaagggt taccaggaca ccctttacgc ccattccttt cgtcagttct acagaaaatg 360
caacatctat ggcaccatag atttcatctt cggcaactcc gccgtcgttt ttcaggattg 420
caatctcctg gcgcggaggc 440

<210> 477
<211> 357
<212> DNA
<213> Pinus radiata

<400> 477
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tgagactgta aatgactggc ctcgcttgag ctattaatca ctcgataccc cgcccatttg 120
acccgatttg tagtgcccgc accagggccg cggttcatgt attccccata gtacagggtg 180
ctgagagcga aggatccatt ccattcgagc caaccggcag gttgaatcag gtcgcccaga 240
aaggactgca tgaagacagt gcgagagtac tctttccatg gcctcccaag atatgcctcg 300
aacgagctct tcactggagc caggtctggg gctgcggtca cattacagtt ctgaatg 357

<210> 478
<211> 318
<212> DNA
<213> Pinus radiata

<400> 478
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gacttgattc agccagcggg ttggttggaa tggaatggca gcttcgctct gagcactctg 180
tactacgggg aatacatgaa cagcggcccc ggcgcgggca ctgccaatcg ggtcagatgg 240
gcggggtatc aggtgattaa gaaatccaag gaggccaaga aatttacagt gtctcaattc 300
attgaaggca attcatgg 318

<210> 479
<211> 271
<212> DNA
<213> Eucalyptus grandis

<400> 479
gaaattcttt ggtaacttga tggatgctgg attatgctcg gtttgtggag aggaaagttt 60
tggaactggc tctgatcata ttcgtgagaa agatgggata tgggctgtgc ttgcttggtt 120
atctattctc gcttacaaaa ataaggagaa cttaagtgga gaaaagcttg tatctgtcga 180
ngacattgtc cgtcagcatt gggngacata tggtcgtcat tattatacca gatatgatta 240
tgagaatgtt gattcaggag cagcaaagga a 271

<210> 480
<211> 301
<212> DNA
<213> Eucalyptus grandis

<400> 480

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aaggagaact taagtggaga aaagcttgta tctgtcgagg acattgtccg tcagcattgg 180
gtgacatatg gtcgtcatta ttataccaga tatgattatg agaatgttga ttcaggagca 240
gcaaaggaac tgatgggata cttggtccaa ctgcaatcat ctctctctga agtcaaccag 300
a 301

<210> 481
<211> 287
<212> DNA
<213> Eucalyptus grandis

<400> 481
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tggaactggc tctgatcata ttcgtgagac agatgggata tgggctgtgc ttgcttggtt 120
atctattctc gcttacaaaa ataaggagaa cttaagtgga gaaaagcttg tatctgtcga 180
ggacattgtc cgtcagcatt gggtgacata tggtcgtcat tattatacca gatatgatta 240
tgagaatgtt gattcaggag cagcaaagga actgatggga tacttgg 287

<210> 482
<211> 285
<212> DNA
<213> Eucalyptus grandis

<400> 482
gaccatatac gtgaaaaaga tggtatctgg gctgttttgg catggctttc catccttgcg 60
tacaagaaca aggaaaatat caatggtgga aagcttgtat cagttgaaga tattgttcgc 120
cagcactggg caacttatgg tcgccactat tacactcgtt atgattatga gaatgttgac 180
gcaggggcag caaaggaact aatggcatac ttggtccggt tgcaatcttc cctcggtgaa 240
gttaatgaga ttgtcaaggg agtatgttcg gatgtgtcaa atgtt 285

<210> 483
<211> 427
<212> DNA
<213> Eucalyptus grandis

<400> 483
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aaaatggtga cgttccaggt gtcgcgagtg gagaccgcgc ccttcgatgg ccagaagccc 120
ggcacctccg gcctccgcaa gaaggtgaaa gtttttgtcc agccccatta cttgcaaaat 180
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gctgcaaatg gagtaaggcg tgtctgggta ggtcagaatg gattactttc cactcctgcc 360
gtgtcagctg tgatccgtga aagagttggg catgatggtc caaggcacag gagcatttat 420
tctgcac 427

<210> 484
<211> 408
<212> DNA
<213> Eucalyptus grandis

<400> 484
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atcctccctg tttatgaaaa tggtgacgtt ccaggtgtcg cgagtggaga ccgcgccctt 120
cgatggccag aagcccggca cctccggcct ccgcaagaag gtgaaagttt ttgtccagcc 180
ccattacttg caaaattttg tgcaatcaac attctatgcc ctttcagctg agaaagtcca 240
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ataataaaga tgtcagctgc aaatggagta aggcgtgtct gggtaggtca gaatggatta 360
ctttccactc ctgccgtgtc agctgtgatc cgtgaaagag ttgggcat 408

<210> 485
<211> 243
<212> DNA
<213> Eucalyptus grandis

<400> 485
gttgaagcca taccctactt ttctggcggt ctcaagggag ttgccaagaa catgcctaca 60
tcagctgccc ttgatgtggt tgctcaacat ctaaatctga agttttttga ggtgcctaca 120
gggtggaaat tctttggtaa cttgatggat gctggattat gctcggtttg tggagaggaa 180
agttttggaa ctggctctga tcatattcgt gagaaagatg ggatatgggc tgtgcttgct 240
tgg 243

<210> 486
<211> 372
<212> DNA
<213> Eucalyptus grandis

<400> 486
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cgcgacccct acgatggcca gaagcccggc acctccggcc tccgcaagaa ggtggaaagt 120
ttttgtccag ccccattact tgcaaaattt tgtgcaatca acattttatg ccctttcagc 180
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tgctatccag atcataataa agatgtcagc tgcaaatgga gtaaggcgtg tctgggtagg 300
tcagaatgga ttactttcca ctcctgccgt gtcagctgtg atccgtgaaa gagttgggca 360
tgatggatcc aa 372

<210> 487
<211> 511
<212> DNA
<213> Eucalyptus grandis

<400> 487
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tgtcgcgagt ggagaccgcg cccttcgatg gccagaagcc cggcacctcc ggcctccgca 120
agaagttgaa agtttttgtc cagccccatt acttgccaaa atttggtgca ntcaacattt 180
tatgcccttt cagctgagaa agtccaagga gctacactcg ttgtttctgg tgatgggcgt 240
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gaaagagttg ggcatgatgg atccaaggct acaggagcat ttattctgac ggcaagtcat 420
aatcccggtg gtccccatga ggattttgga atcaagtata acatggaaaa tggtggacct 480
gctcctgagg cgatcactga taagatgtat g 511

<210> 488
<211> 465
<212> DNA
<213> Eucalyptus grandis

<400> 488
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gtgtcgcgag tggagaccgc gcccttcgat ggccagaagc ccggcacctc cggcctccgc 120
aagaagttga aagtttttgt ccagccccat tacttgcaaa attttgtgca atcaacattt 180
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tatttctcta aggatgctat ccagatcata ataaagatgt cagctgcaaa tggagtaagg 300
cgtgtctggg taggtcagaa tggattactt tccactcctg ccgtgtcagc tgtgatccgt 360

gaaagagttg ggcatgatgg atccaaggct acaggagcat ttattctgac ggcaagtcat 420
aatcccggtg gtccccatga ggattttgga atcaagtata acatg 465

<210> 489
<211> 514
<212> DNA
<213> Eucalyptus grandis

<400> 489
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aggtgtcgcg agtggagacc gcgcccttcg atggccagaa gcccggcacc tccggcctcc 120
gcaagaaggt gaaagttttt gtccagcccc attacttgca aaattttgtg caatcaacat 180
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ataatcccgg tggtccccat gaggattttg gaatcaagta taacatggaa aatggtggac 480
ctgctcctga ggcgatcact gataagatgt atga 514

<210> 490
<211> 442
<212> DNA
<213> Eucalyptus grandis

<400> 490
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acgttccagg tgtcgcgagt ggagaccgcg cccttcgatg gccagaagcc cggcacctcc 120
ggcctccgca agaaggtgaa agtttttgtc cagccccatt acttgcaaaa ttttgtgcaa 180
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gtgatccgtg aaagagttgg gcatgatgga tccaaggcta caggagcatt tattctgacg 420
gcaagtcata atcccggtgg tc 442

<210> 491
<211> 520
<212> DNA
<213> Eucalyptus grandis

<400> 491
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acgttccagg tgtcgcgagt ggagaccgcg cccttcgatg gccagaagcc cggcacctcc 120
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ggtggacctg ctcctgaggc gatcactgat aagatgtatg 520

<210> 492
<211> 418
<212> DNA
<213> Eucalyptus grandis

<400> 492
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acgttccagg tgtcgcgagt ggagaccgcg cccttcgatg gccagaagcc cggcacctcc 120
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<210> 493
<211> 424
<212> DNA
<213> Eucalyptus grandis

<400> 493
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gtaaagacga atggttgccc cttctgagcc ggttcccgag agacggaaaa tnaggcgcga 360
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tttg 424

<210> 494
<211> 257
<212> DNA
<213> Eucalyptus grandis

<400> 494
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ggatgttgtt gctaaacatt taaatttgaa gtttttgag gttccaacgg gctggaaatt 180
ctttggtaac ttaatggatg ctggattatg ttcagtttgt ggggaagaaa gtttcggaac 240
tgggtcagac catatac 257

<210> 495
<211> 483
<212> DNA
<213> Eucalyptus grandis

<400> 495
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cggtaaattc ctgcattttt gaaagcttga gagcaacttc cacaagagga gccaatgctt 120
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cttcagagag agaagattgc agttggacca agtatcccat cagttccttt gctgctcctg 420
aatcaacatt ctcataatca tatctggtat aataatgacg accatatgtc acccaatgct 480
gac 483

<210> 496
<211> 353
<212> DNA
<213> Eucalyptus grandis

<400> 496
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cctttgctgc tcctgaatca acattctcat aatcatatct ggtataataa tgacgaccat     120
atgtcgccca atgctgacgg acaatgtcct caacagatac aagcttttct ccacttaagt     180
tctccttatt tttgtaagcg agaatagata accaagcaag cacagcccat atcccatctt     240
tctcacgaat atgatcagag ccagttccaa aactttcctc tccacaaacc gagataatcc     300
agcatccatc aagttaccaa agaatttcca ccctgtaggc acctcaaaaa act            353

<210> 497
<211> 442
<212> DNA
<213> Eucalyptus grandis

<400> 497
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tcagattctg ttgctattat tgctgcaaat gctgttgaag caatacccta cttctccgga     300
ggcttaaagg gagttgccag gagcatgcaa catcagctgc cttggatgtt gttgctaaac     360
atttaaattt gaagtttttt gaggttccaa cgggctggaa attctttggt aacttaatgg     420
atgctggatt atgttcagtt tg                                              442

<210> 498
<211> 364
<212> DNA
<213> Eucalyptus grandis

<400> 498
gccaaccgca tatttgtaga agagcttggt gcacaagaga gctcattatt gaactgcaca      60
cctaaggagg attttggagg gggtcaccca gatccaaatt tgacatatgc aaaggagctg     120
gtggcacgga tgggtttggg caagtcaagt cctcagcatg agccaccaga atttggtgct     180
gctgctgatg gtgatgctga tcgtaatatg gttctcggaa aaaggttctt tgttactcca     240
tcagattctg ttgctattat tgctgcaaat gctgttgaag caatacccta cttctccgga     300
ggcttaaagg gagttgccag gagcatgcca acatcagctg ccttggatgt tgttgctaaa     360
catt                                                                  364

<210> 499
<211> 365
<212> DNA
<213> Eucalyptus grandis

<400> 499
ccgtgtcagc tgtgatccgt gaaagagttg ggcatgatgg atccaaggct acaggagcat      60
ttattctgac ggcaagtcat aatcccggtg gtccccatga ggattttgga atcaagtata     120
acatggaaaa tggtggacct gctcctgagg cgatcactga taagatgtat gaaaatacaa     180
aaacaataaa agaatatcta attgcagaaa atctccctca tgtggatatt gctgcaattg     240
gtgtcacaag ctttacgggg ccagagggtc aattcgatgt tgaggttttt gattcagcca     300
gtgactatgt taaattaatg aagtcaattt ttgacttcca ggcgatccga aagctgcttt     360
catct                                                                 365

<210> 500
<211> 390
<212> DNA
<213> Eucalyptus grandis

<400> 500
ggctacagga gcatttattc tgacggcaag tcataatccc ggtggtcccc atgaggattt      60
tggaatcaag tataacatgg aaaatggtgg acctgctcct gaggcgatca ctgataagat     120
```

```
gtatgaaaat acaaaaacaa taaaagaata tctaattgca gaaaatctcc ctgatgtgga    180
tattgctgca attggtgtca caagctttac ggggccagag ggtcaattcg atgttgaggt    240
ttttgattca gccagtgact atgttaaatt aatgaagtca atttttgact tccaggcgat    300
ccgaaagctg ctttcatctc caaattttac cttctgctat gatgctctcc atggagttgc    360
tggagcatat gccaaccgca tatttgtaga                                     390
```

<210> 501
<211> 341
<212> DNA
<213> Eucalyptus grandis

<400> 501

```
ggtaggtcag aatggattac tttccactcc tgccgtgtca gctgtgatcc gtgaaagagt     60
tgggcatgat ggatccaacg ctacaggagc atttattctg acggcaagtc ataatcccgg    120
tggtccccat gaggattttg gaatcaagta taacatggaa aatggtggac ctgctcctga    180
ggcgatcact gataagatgt atgaaaatac aaaaacaata aaagaatatc taattgcaga    240
aaatctccct gatgtggata ttgctgcaat tggtgtcaca agctttacgg ggccagaggg    300
tcaattcgat gttgaggttt ttgattcagc cagtgactat g                       341
```

<210> 502
<211> 600
<212> DNA
<213> Eucalyptus grandis

<400> 502

```
gctaaaagaa aaaacaaata aataaaaaaa gaaataattt tgcagacaaa atttgaaaaa     60
actgtcatct cgccttgctc agttccccac cacctttcct ggcaccatca tcgacatcct    120
ccctgtttct gaaaatggtg acgttccagg tgtcgcgagt ggagaccgcg cccttcgatg    180
gccagaagcc cggcacctcc ggcctccgca agaaggtgaa agtttttgtc cagccccatt    240
acttgcaaaa ttttgtgcaa tcaacatttt atgccctttc agctgagaaa gtccaaggag    300
ctacactcgt tgtttctggt gatgggcgtt atttctctaa ggatgctatc cagatcataa    360
taaagatgtc agctgcaaat ggagtaaggc gtgtctgggt aggtcagaat ggattacttt    420
ccactcctgc cgtgtcagct gtgatccgtg aaagagttgg gcatgatgta agctatcttt    480
ttctctttgg tggcatccaa ttgtataacc ctttgactat gcaatcacaa tgcagcaata    540
ttatctggat atgaagtgct ctctaacaaa atacgtacac aatctatcat cagggatcca    600
```

<210> 503
<211> 360
<212> DNA
<213> Eucalyptus grandis

<400> 503

```
gcaaaactgt ttacatgagg ggtcggtaaa aatcttactg tggcgaaagc gggatctatg     60
tgatcacggt tggggcagat cgcccggtaa attcctgcat ttttgaaagc ttgagagcaa    120
cttccacaag aggagccaat gcttcctgag aatctctccc agtttttgct ggatccttct    180
catactgctc tatgtaaaga cgaatggttg caccttccga gcctgttccc gagaggcgaa    240
aaacaagtcg tgacccatct tcgaacaaat atcgaatacc ctggtgctta gaaatggaac    300
catcaacagg atccttatat tcaaattcat cagcatgaac aacatttgat gcatcaggac    360
```

<210> 504
<211> 395
<212> DNA
<213> Pinus radiata

<400> 504

```
gttcttggca agaggttttt tgtgactcca tcagattctg ttgccatcat tgcagcaaat     60
gcagttgaag ccattccata cttcagctct ggattgaaag gtgttgcaag aagcatgccg    120
```

acatcagctg cacttgatgt agttgcaaaa agtcttaatc ttaggttttt cgaggtgccc 180
actggctgga agtttttttgg aaatttaatg gatgctggaa tgtgttctgt ttgtggtgaa 240
gagagtttcg gcactggttc cgaccatatc cgagagaagg atggaatctg ggcagtttta 300
gcatggcttt caattctagc ttacaaaaat aaggataacc ttgatggcgg gaagcttgtc 360
actgtagagg acatagtccg taaccattgg gcttc 395

<210> 505
<211> 477
<212> DNA
<213> Pinus radiata

<400> 505
tccatctcca ctacaaccac tatcatgacc cgcttcaaca tccaagaggt ttctaccaag 60
ccctacgagg gccagaagcc tggtacgtcc gggctgcgaa agagggtgaa ggtgttccag 120
caagagcact ataccgagaa cttcgtccaa gctatcctcg atgcgatgcc tggacctggt 180
gtcaacggct caaccctcgt tgtcggaggt gacggtcgat accactccga gcctaccgtg 240
caatcgatcc tcaagatcgc ggccgcaaac ggcgtgaaga agctatacat tggcaaagac 300
gcaatccttt cgaccccggc cgcctcgaac atcattcgcc agtacaaggc cgatggtggt 360
atcctgctga ccgccagtca caaccctggt ggaccggaca atgactttgg tatcaagtac 420
aacatcaaca acggtgggcc ggccccagag agcgttaccg acaagatctt cgagcgc 477

<210> 506
<211> 436
<212> DNA
<213> Pinus radiata

<400> 506
tggaaacaga accatcaacc ggatctttgt attcaaattc atcggcatcc acgacaccag 60
aaacatctgg cctcacttcc ttaattaatt tgttaacttc ggggagagaa gactgcagct 120
taattaaatg tgacatgagc tccttggcag cacctgcatc aacattttca tagtcatagc 180
gtgtataata gtggcgacca taagaagccc aatggttacg gactatgtcc tctacagtga 240
caagcttccc gccatcaagg ttatccttat ttttgtaagc tagaattgaa agccatgcta 300
aaactgccca gattccatcc ttctctcgga tatggtcgga accagtgccg aaactctctt 360
caccacaaac agaacacatt ccagcatcca ttaaatttcc aaaaaacttc cagccagtgg 420
gcacctcgaa aaacct 436

<210> 507
<211> 473
<212> DNA
<213> Eucalyptus grandis

<400> 507
tgataatgaa gggaagattc ttagagtgag gttgataatg aaagagggtg tgaagtattt 60
caacccggta tacctgtttg acgagggctc gaccatctct tggatcccgt gtggaagaaa 120
gctcacttgc tcttaccccg gcatcaagtt cacttatggc ccggagagtt acttcgggca 180
cgaggtgtct gtgttggaga tggatgggca atttgacaga ctagatgagc tcatctatgt 240
ggaaagccat ttgagcaacc tctccacaaa attctatggt gaagtcaccc agcagatgct 300
gaagcactcc gaattccccg gaagcaacaa tggcactggt ctcttccaga ccatagttgg 360
gctaaaaatc agagacctct atgagcaaat cacagccagc aaagcagctg caccattaca 420
aggcactaaa gcttaggact tccatatact agttccccct cttctttctc aat 473

<210> 508
<211> 379
<212> DNA
<213> Eucalyptus grandis

<400> 508

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gctcatcaag cctcccaaga tcctggtcat tgagggactt cacccaatgt tcgaccagcg     60
cgttagggac ttgctggact tcagcatata tttggacatc agcaatgagg tcaaatttgc    120
atggaaaatc cagagggaca tggccgagcg aggacacagt ctcgagagca tcaaagctag    180
cattgaagcc cgaaagccag attttgaagc ctatatagac ccacagaagc agtatgcaga    240
tgcagtgatt gaagtgctgc caacacagct aatccctggt gataatgaag ggaagattct    300
tagagtgagg ttgataatga aagagggtgt gaagtatttc aacccggtat acctgtttga    360
cgagggctcg accatctct                                                  379
```

<210> 509
<211> 459
<212> DNA
<213> Eucalyptus grandis

<400> 509

```
aaagaaaana accncagagg agcaggccct taatcgtacc ctccgacacc cgactttctc     60
tctctaccta accgttaaga ctcccgtaag gacacaattc agagcgagaa agaagagaga    120
gaaagctcgc gtgcgataga gagagagaga gagagagaga tgtcgaccgc ctcggtttgc    180
tcctcgacgc tccagtcgca gatcggcggc ctcgagctcc ggcggtcttc cctccggcgg    240
ccgagcaacg tcgctttcac caggaagatc cagacggtgg tgaaggcatc ttcacgagtt    300
gacaaattct ccaaaagtga tatcattgta tctccatcaa ttctatctgc taatttttcg    360
aagctgggag atcaggtgaa agctgtggag ttggcaggat gtgattggat ccacgttgat    420
gtaatggatg gccgttttgt tcccaatatt acaatcggt                            459
```

<210> 510
<211> 268
<212> DNA
<213> Eucalyptus grandis

<400> 510

```
tcaccaggaa gatccagacg gtggtgaagg catcttcacg agttgacaaa ttctccaaaa     60
gtgatatcat tgtatctcca tcaattctat ctgctaattt ttcgaagctg ggagatcagt    120
aatccaggtg aaagctgtgg agttggcagg atgtgattgg atccangttg atgtaatgga    180
tggccgtttn gttcccaata ttacaatcgg tcccccttgtg gttggtgccc tgcgccctgt   240
aacagatctt cctctggatg ttcatctg                                        268
```

<210> 511
<211> 293
<212> DNA
<213> Eucalyptus grandis

<400> 511

```
gnaaaaaaga gagatgtcga ccgcctcgct ttgctcctcg acgctccagt cgcagattcg     60
gcggcctcga gctccggcga tcctcccttc gccggccgag caacgtcgct ttcaccagga    120
agatccagac ggtggtgaag gcatcttcac gagttgacaa attctccaaa agtgatatca    180
ttgtatctcc atcaattcta tctgctaatt tttcgaagct gggagatcag gtgaaagctg    240
tggagttggc aggatgtgat tggatccacg ttgatgtaat ggatggccgt ttt           293
```

<210> 512
<211> 423
<212> DNA
<213> Eucalyptus grandis

<400> 512

```
gtggagttgg caggatgtga ttggatccac gttgatgtaa tggatggccg ttttgttccc     60
aatattacaa tcggtcccct tgtggttggt gccctgcgcc ctgtaacaga tcttcctctg    120
gatgttcatc tgatgattgt ggaacctgaa cagcgagtac cggatttcat caaggctgga    180
gctgacatag tcagtgtgca ttgtgaacaa acttctacca tccacttgca tcgcacggtc    240
```

aaccaaatca aaagtctggg agctaaagct ggagttgtcc tgaaccctgc taccccacta 300
actgctatag aatatgttct tgatgtggtt gatctggtgt tgatcatgtc ggngaaccct 360
ggctttggtg ggcaaagctt tatcgagagc caagtgacga aaatatcaga cttgagaagg 420
atg 423

<210> 513
<211> 508
<212> DNA
<213> Pinus radiata

<400> 513
cacagcagcc cacgggccca ggacggtcgg tgggtttggt tagacctgtc tgaacaaggg 60
ccagtgagca attgagggat cactgaaaat ggaagggaac acagagaagg gggttatccc 120
taaaattgcc ccgtcaatgt tgtcatcaga ctttgcgaat ctggcttcag aggcgaaata 180
tatgacggaa aatggtgcag attggttgca tatggacatc atggatgggc atttcgttcc 240
aaatcttacc attggagcac ctgtgattca gagtttgagg aagcataccc aggcattctt 300
ggattgtcat cttatggtca caaaccctct tgattatgtg gagccatttg caaaagctgg 360
agcttcaggg ttcacttttc atgtggaggc tgccaaagac aattggcaag atctcatcaa 420
aagaatcaga aatgctggca tgcggcctgg agtggcagtg aaacctggaa cttctataga 480
aaactgttta tccctttggt ggaaagtg 508

<210> 514
<211> 502
<212> DNA
<213> Pinus radiata

<400> 514
cacagcagcc cacgggccca ggacggtcgg tgggtttggt tagacctgtc tgaacaaggg 60
ccagtgagca attgagggat cactgaaaat ggaagggaac acagagaagg gggttatccc 120
taaaattgcc ccgtcaatgt tgtcatcaga ctttgcgaat ctggcttcag aggcgaaata 180
tatgacggaa aatggtgcag attggttgca tatggacatc atggatgggc atttcgttcc 240
aaatcttacc attggagcac ctgtgattca gagtttgagg aagcataccc aggcattctt 300
ggattgtcat cttatggtca caaaccctct tgattatgtg gagccatttg caaaagctgg 360
agcttcaggg ttcacttttc atgtggaggc tgccaaagac aattggcaag atctcatcaa 420
aagaatcaga aatgctggca tgcggcctgg agtggagtga aacctggaac ttctatagaa 480
actgttatcc tttggtggaa gt 502

<210> 515
<211> 447
<212> DNA
<213> Pinus radiata

<400> 515
tcccgtcaca tttttaaat ttcattttgt tgccttgagg tctagagatc gattcttagg 60
catgtcaaca gcagcgatat caatatgcgc cacggtcgct atggtgggtt ctcagagcac 120
ccattctatg ggtgtctgcc gtagtccgtt ctggggaaag aagcataaca tggcctttgc 180
aggcccccaa ttggcgaact cttcaaggaa agttctctct acagtgaagg catcttcccg 240
agtagacaag ttctccaaaa ctgacatcat tgtctctcct tctattcttt ctgcaaattt 300
tgcaacatta ggtgaccagg tcaaagctgt ggagttggca ggttgcgatt gggttcatgt 360
tgatgtcatg gatgggcgtt ttgtgccaaa tattaccatt ggacctctgg tggtggctgc 420
attacgaccc gtaacagatt tgccact 447

<210> 516
<211> 403
<212> DNA
<213> Pinus radiata

<400> 516
tgcatttcga gtttaccaag atatcccgtc acatttttta aatttcattt tgttgccttg 60
aggtctagag atcgattctt aggcatgtca acagcagcga tatcaatatg cgccacggtc 120
gctatggtgg gttctcagag cacccattct atgggtgtct gccgtagacc gttctgggga 180
aagaagcata acatggcctt tgcaggcccc caattggcga actcttcaag gaaagttctc 240
tctacagtga aggcatcttc ccgagtagac aagttctcca aaactgacat cattgtctct 300
ccttctattc tttctgcaaa ttttgcaaca ttaggtgacc aggtcaaagc tgtggagttg 360
gcaggttgcg attgggttca tgttgatgtc atggatgggc cgt 403

<210> 517
<211> 379
<212> DNA
<213> Pinus radiata

<400> 517
attctatggg tgtctgccgt agtccgttct ggggaaagaa gcataacatg gcctttgcag 60
gcccccaatt ggcgaactct tcaaggaaag ttctctctac agtgaaggca tcttcccgag 120
tagacaagtt ctccaaaact gacatcattg tctctccttc tattctttct gcaaattttg 180
caacattagg tgaccaggtc aaagctgtgg agttggcagg ttgcgattgg gttcatgttg 240
atgtcatgga tgggcgtttt gtgccaaata ttaccattgg acctctggtg gtggctgcat 300
tacgacccgt aacagatttg ccactggatg tacatttgat gattgttgaa ccggaacaac 360
gtgtaccaga ttttatcaa 379

<210> 518
<211> 404
<212> DNA
<213> Pinus radiata

<400> 518
attctatggg tgtctgccgt agtccgttct ggggaaagaa gcataacatg gcctttgcag 60
gcccccaatt ggcgaactct tcaaggaaag ttctctctac agtgaaggca tcttcccgag 120
tagacaagtt ctccaaaact gacatcattg tctctccttc tattctttct gcaaattttg 180
caacattagg tgaccaggtc aaagctgtgg agttggcagg ttgcgattgg gttcatgttg 240
atgtcatgga tgggcgtttt gtgccaaata ttaccattgg acctctggtg gtggctgcat 300
tacgacccgt aacagatttg ccactggatg tacatttgat gattgttgaa ccggaacaac 360
gtgtaccaga ttttatcaag gctggtgcag acattgttag tgtc 404

<210> 519
<211> 705
<212> DNA
<213> Pinus radiata

<400> 519
gaagcaacca tactctcaag ttacatcaca gcagcccacg ggcccaggaa ggtcggtggg 60
tttggttaga cctgtctgaa caaggtcttt ggggccagtg agcaattgag ggatcactga 120
aaatggaagg caacacagag aaggggggtta tccctaaaat tgctccgtca atgttgtcat 180
cagactttgc gaatctggct tcagaggcga aatatatgac ggaaaatggt gcagattggt 240
tgcatatgga catcatggat gggcatttcg ttccaaatct taccattgga gcacctgtga 300
ttcagagttt gaggaagcat acccaggcat tcttggattg tcatcttatg gtcacaaacc 360
ctcttgatta tgtggagcca tttgcaaaag ctggagcttc agggttcact tttcatgtgg 420
aggctgccaa agacaattgg caagatctca tcaaaagaat cagaaatgct ggcatgcggc 480
ctggagtggc agtgaaacct ggaacttcta tagaaactgt tatcctttgg tggaaagtga 540
agaacctgtg gaaatggtgt tagtgatgac tggtgagcct gcttttggag ggcagaaatc 600
atgccagata tgatggataa ggtcatgatc tacggcggaa gtatcctacc cttgatattg 660
aggtgatggc ggttaagccc atctacaatt aaccagcgtc tgctg 705

<210> 520

<211> 459
<212> DNA
<213> Pinus radiata

<400> 520
attttgaggt ctgagtgaat tgatttttga gtgtattagg gccagtgagc aattgaggga 60
tcactgaaaa tggaagggaa cacagagaag gggggttatcc ctaaaattgc cccgtcaatg 120
ttgtcatcag actttgcgaa tctggcttca gaggcgaaat atatgacgga aaatggtgca 180
gattggttgc atatggacat catggatggg catttcgttc caaatcttac cattggagca 240
cctgtgattc agagtttgag gaagcatacc caggcattct tggattgtca tcttatggtc 300
acaaaccctc ttgattatgt ggagccattt gcaaaagctg gagcttcagg gttcactttt 360
catgtggagg ctggcaaaga caattggcaa gatctcatca aaagaatcag aaatgctggc 420
atgcggcctg gagtggcagt gaaacctgga acttctata 459

<210> 521
<211> 410
<212> DNA
<213> Pinus radiata

<400> 521
gggccagtga gcaattgagg gatcactgaa aatggaaggc aacacagaga agggggttat 60
ccctaaaatt gccccgtcaa tgttgtcatc agactttgcg aatctggctt cagaggcgaa 120
atatatgacg gaaaatggtg cagattggtt gcatatggac atcatggatg ggcatttcgt 180
tccaaatctt accattggag cacctgtgat tcagagtttg aggaagcata cccaggcatt 240
cttggattgt catcttatgg tcacaaaccc tcttgattat gtggagccat ttgcaaaagc 300
tggagcttca gggttcactt ttcatgtgga ggctgccaaa gacaattggc aagatctcat 360
caaaagaatc agaaatgctg gcatgcggcc tggagtggca gtgaaacctg 410

<210> 522
<211> 286
<212> DNA
<213> Eucalyptus grandis

<400> 522
atggttcgga tggccaatct ctgtgtggtg tgcagtcatg ctgttaatgg tgttgctgag 60
attcacagtg aaatcgtaaa gaaggaagtg tttcatgaat tctttaagtt atggcctgaa 120
aaatttcaaa acaaaacaaa tggggtgaca ccaagaagat ggattccttt ctgcaatcct 180
gagttaagta agattatnac tagatggatt ggcacagaag actggatcct ccacacagat 240
aaactagctg agttgcgtaa gtttgcagat aatgaggatc ttcaga 286

<210> 523
<211> 443
<212> DNA
<213> Eucalyptus grandis

<400> 523
ggtaactctg gatatggtcg aggagattat tttcttgttg gccatgactt ccccagttat 60
atggaagccc aagcaagagt agatgatgcc tacaaggaca gaagaggatg gctcaggatg 120
tccatcttaa gcactgctgg aagtggcaaa tttagcagtg accgaacaat tgctcagtac 180
gccaaagaaa tctggaacgt agaggggtgc tgtgtaccat gaaaagcaat ttgaaactag 240
acccgctttt agcttccctc ccttccctcc tctctccctc ttactttata tattgcgata 300
gaggggcaac catgctctgt aatttatgct tgtaaaacca gattcattac acaaatgcac 360
tccgcctaac tgcggatgag aaataagcat ggatgtaatg atatacagtg taactttcct 420
ttataaaaaa aaaaaaaaaa aaa 443

<210> 524
<211> 265

<212> DNA
<213> Eucalyptus grandis

<400> 524
gttaggcatg acgtggtttt ccctgttaga ttttttggcc acgtggaggt tactccaaat 60
ggatcccgaa aatgggtggg tggagaggta ttgcaagctc tagcatatga tgtcccaatt 120
cccggataca agaccaagaa cactaatagt cttcgtctct gggaagcaaa agcttcttct 180
caggatttca accttttcca attcaatgat ggacagtatg aatcagctgg acagttgcac 240
tctcgagctg aacaaatttg tgctg 265

<210> 525
<211> 363
<212> DNA
<213> Eucalyptus grandis

<400> 525
ggcaattgtc cttgtcataa tatcccatgc ctcgtcccac ccaagtcctt catcgtccat 60
taacagacgc attaactctg gaatcgcaag agtgggatga gtgtcattca gctgtactgc 120
aactttggtt gggaagtcaa cccactgccg tgatccttct ccacctttcc tctccttgaa 180
cctgaagatt atatcctgca gcgatgcact acagagaaag aattgttgct tcagccgtaa 240
aagttttcca ctctctgttg catctccagg atataaaaca gcacaaattt gttcagctcg 300
agagtgcaac tgtccagctg attcacactg tccatcattg aattggaaaa ggttgaaatc 360
ctg 363

<210> 526
<211> 344
<212> DNA
<213> Eucalyptus grandis

<400> 526
ggcaattgac cttgtcataa tatcccatgc ctcgtcccac ccaagtcctt catcgtccat 60
taacagacgc attaactctg gaatcgcaag agtgggatga gtgtcattca gctgtactgc 120
aactttggtt gggaagtcaa cccactgccg agaaccttct ccacctttcc tctccttgaa 180
cctgaagatt atatcctgca gcgatgcact acagagaaag aattgttgct tcagccgtaa 240
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<210> 527
<211> 445
<212> DNA
<213> Eucalyptus grandis

<400> 527
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<210> 528
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<213> Eucalyptus grandis

<400> 528
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gatataagaa acttaaggag atgagtcctg aagagaggaa aaagacaact tcacgaacag 180
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<210> 529
<211> 505
<212> DNA
<213> Pinus radiata

<400> 529
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<210> 530
<211> 540
<212> DNA
<213> Pinus radiata

<400> 530
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<210> 531
<211> 398
<212> DNA
<213> Eucalyptus grandis

<400> 531
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tggccttata cggggtgaaa acatggagct tggccgtg 398

<210> 532
<211> 225
<212> DNA
<213> Eucalyptus grandis

<400> 532
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cgcggcagaa gaagcagctt gaaggtgaag aagcccagag aaaatctaag cgtcgacttg 120
aacgtgaaag gggtcgcaga gaagcgactg cggacatgtc tgaggactta tctgagggag 180
aaaagggtga tgcagtcagc gatatatcga ctcatggtga tagca 225

<210> 533
<211> 415
<212> DNA
<213> Eucalyptus grandis

<400> 533
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gaagcccaga gaaaagctaa gcgtcgactt gaacgtgaaa ggggtcgcag agaagcgact 180
gcggacatgt ctgaggactt atctgaggga gaaaagggtg atgcagtcag cgatatatcg 240
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acatggattg gtcaacagaa ggggaagaag ctttaccttg tattaataag tcttcatggc 360
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<210> 534
<211> 335
<212> DNA
<213> Eucalyptus grandis

<400> 534
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caatacgaca tacaagataa tgcgccgaat agaggcagaa gaactgtccc ttgattcctc 180
tgagatagtg ataactagta ctaggcagga gattgatgag caatggcgct tgtatgatgc 240
ttttgatccg atattggaga agaagctacg agcaaggata aagcgcaatg taagctgtta 300
tggaaggttc atgccgcgca tggctataat acctc 335

<210> 535
<211> 238
<212> DNA
<213> Eucalyptus grandis

<400> 535
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cgatcctcga cgtcggcccg gcgctcgacg acaagaaatc gtcgctgctg ctgcgggagc 180
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<210> 536
<211> 441
<212> DNA
<213> Eucalyptus grandis

<400> 536
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ggatggcaac aggccacact ggttggccac cgccaacttg ctctcctagg acttttgaca 180
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cgccataact ccaatcaaca tctggtgatg atatctgtct agtaagcaag tccactcgat 420
aaacgcctgg cattgaacct a 441

<210> 537
<211> 389
<212> DNA
<213> Eucalyptus grandis

<400> 537
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aatgtcacaa ccttgctgaa ggctttcgg 389

<210> 538
<211> 647
<212> DNA
<213> Eucalyptus grandis

<400> 538
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ttctgttgat gcaatggaga catggattgg tcaacagaag gggaagaagc tttaccttgt 600
attaataagt cttcatggcc ttatacgggg tgaaaacatg gagcttg 647

<210> 539
<211> 340
<212> DNA
<213> Eucalyptus grandis

<400> 539
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ctcgacgtcg gcccggcgct cgacgacaag aaatcgtcgc tgctgctgcg ggagcgcggc 180
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ctggagaaca tgtgctggag gatttggaac ctcgcgcggc 340

<210> 540
<211> 320
<212> DNA
<213> Eucalyptus grandis

<400> 540
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gatcctcgac gtcggcccgg cgctcgacga caagaaatcg tcgctgctgc tgcgggagcg 180
cggccgcttc agccccaccc gctacttcgt cgaggaggtc atcaccggct tcgatgagac 240
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cggaggagac gtctcgttcg 320

<210> 541
<211> 386
<212> DNA
<213> Eucalyptus grandis

<400> 541
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gagcaagttg gcggtggcca accagtgtgg cctgttgcca tccatggtca ctatgctgat 180
gctggggatt ccgctgctct tctatctggg gctcttaacg taccaatgct atttactggt 240
cactcacttg gtcgagataa gttggaacaa ctcctcaagc aaggccgtct gtccagggat 300
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tctctgagat agtgataact atacta 386

<210> 542
<211> 326
<212> DNA
<213> Eucalyptus grandis

<400> 542
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agcgcccctg cctgcggcgg cgatggcggg gaacgactgg atcaacagct acctcgaggc 120
gatcctcgac gtcggcccgg cgctcgacga caagaaatcg tcgctgctgc tgcgggagcg 180
cggccgcttc agccccaccc gctacttcgt cgaggaggtc atcaccggct tcgatgagac 240
cgatctctac cgctcctggg tcaaggtgag tcagatcgag agcgcgcgcg cgggggcggc 300
ggaggagacg tctcgttcgg ttgatt 326

<210> 543
<211> 363
<212> DNA
<213> Eucalyptus grandis

<400> 543
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acagctacct cgaggcgatc ctcgacgtcg gcccggcgct cgacgacaag aaatcgtcgc 180
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ccggcttcga tgagaccgat ctctaccgct cctgggtcaa ggcccaggcg acgaggagcc 300
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aga 363

<210> 544
<211> 558
<212> DNA
<213> Eucalyptus grandis

<400> 544
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gcgatcctcg acgtcggccc ggcgctcgac gacaagaaat cgtcgctgct gctgcgggag 180
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ccgatctcta ccgctcctgg gtcaaggccc atgcgacgag gagcccgcag gagaggaaca 300
cgcgactgga gaacatgtgc tggaggattt ggaacctcgc gcggcagaag aagcagcttg 360
aaggtgaaga agcccagaga aaatctaagc gtcgacttga acgtgaaagg ggtcgcagag 420
aagcgactgc ggacatgtct gaggacttat ctgagggaga aaagggtgat gcagtcagcg 480
atatatcgac tcatggtgat agcaacagag gcagattgcc taggataagt tctgttgatg 540
caatggagac atgggttg 558

<210> 545
<211> 414
<212> DNA
<213> Eucalyptus grandis

<400> 545
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cggtgggaaa tggcggggaa cgagtgggtg aacagctacc tggaggccat cctcgacgtc 120
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aacatgtgct ggaggatatg gaatctcgct cgcaagaaga agcngcttga gggagaggaa 360
gctcaacgca tcgctaagcg gcgtcttgaa catgaaagag gtcgtagaga ggca 414

<210> 546
<211> 289
<212> DNA
<213> Eucalyptus grandis

<400> 546
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gcgatcctcg acgtcggccc ggcgctcgac gacaagaaat cgtcgctgct gctgcgggag 180
cgcggccgct tcagcccacc cgctacttcg tcgaggaggt catcaccggc ttcgatgaga 240
ccgatctcta ccgctcctgg gtcaaggccc aggcgacgag gagcccgca 289

<210> 547
<211> 227
<212> DNA
<213> Eucalyptus grandis

<400> 547
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gggttggtca acagnnggga agaagcttta ccttgtatta ataagtcttc atggcctata 180
cggggtgaaa acatggagct tggccgagac tcggatactg gtggtca 227

<210> 548
<211> 415
<212> DNA
<213> Pinus radiata

<400> 548
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gttgcagacc aagagcctgc agaagctgat ggagaccttg cagctttgat caatggtgat 120
ggtaacttat ctcctaaagc cttgccaccc atatggtccg aggtgatgcg ttttttcaca 180
aatcgacaca aacccatgat tcttgcttta tcacgacctg atcccaaaaa aaaatctcac 240
tactctagtc aaagcgtttg gagaatgccg gccattaaaa gagctggcaa atttgacact 300

agtaatggga aacagagatg atatagatga aatgtcggga ggtaatgcag ctgttctaac 360
aacggttttg aagctgatag ataagtatga cttgtatggg caagttgctt atcca 415

<210> 549
<211> 299
<212> DNA
<213> Pinus radiata

<400> 549
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aagcgcgctt tttcgcggaa cttctccgac ttgcaagtct ggtctgatga caataaggga 180
aagcgcctgt acattgtgct cataagcttg catggtttag taagaggtga aaacatggaa 240
ttgggtagag attctgatac aggcgggcag gttaaatacg ttgtagaact tgcaagagc 299

<210> 550
<211> 304
<212> DNA
<213> Pinus radiata

<400> 550
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tcccacggtt tttgaacaat ccctcgaagc ccattatttt ggctcttgct cgacctgatc 240
ccaagaagaa catggccact ttagtcaagg cttttggtga atgtatcaaa ttgaggaagc 300
tggc 304

<210> 551
<211> 464
<212> DNA
<213> Pinus radiata

<400> 551
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catacatagt tcgaattccc tgtggatgca aagaaaagta tattcagaaa gaattgtttg 120
gccatacatt ccagagtttg tagatggagc actgggtcat attcttaata tttccaaagc 180
attgggagat ctgattggag aagacacacc tgtatggcct catgtaatcc atggccacta 240
tgcagatgca ggggatgctg cttgccttct ttctggtgct ctgaacgttc caatggtttt 300
gacaggccat tctctaggcc gaaataaact agaacaatta ttgaaacaag gattgcattc 360
caaggaagat atcaatgcaa cgtacaagat catgcgtagg attgaagctg aagaattgtg 420
ccttgattcc gctgagcttg tggtgacaag taccaaggca agaa 464

<210> 552
<211> 312
<212> DNA
<213> Eucalyptus grandis

<400> 552
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agncgacgag ccccattaat ctggtggcat caccgaactc aagggggttg tcacccgggg 240
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ttgaataatt ga 312

<210> 553

<211> 442
<212> DNA
<213> Eucalyptus grandis

<400> 553
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cattcttaaa ttccgggaat tg 442

<210> 554
<211> 421
<212> DNA
<213> Eucalyptus grandis

<400> 554
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tttttgttca gccggctttt tatgaagctt ttggacttac agttgttgag gctatgacgt 180
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tctttgagca aagtaaaaag gaccccaatc actggactaa aatctctgct gctggacttc 360
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<210> 555
<211> 448
<212> DNA
<213> Pinus radiata

<400> 555
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accaaaaagc cattctaaag caagatggtg tcttacttgt gttcaagtgt gtcaacagga 120
ctgaacagaa gttcttcaat agcgtcatgg aaatgtgtaa gccgactctc tctttctttg 180
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tactgcccaa ctgtgtcctc actgcatcca ccagaatatg gnaaactata aacatttcag 360
ccaactacaa tgttaaaatg aaacttattc aatgctaaga caaataaaat gagggctgaa 420
gcttaggccc tttgcttcaa aaaaaaa 448

<210> 556
<211> 348
<212> DNA
<213> Eucalyptus grandis

<400> 556
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aggaattgcc aatgctgttg gtttggcact cgtagagaag catttggctg ctcgcttcaa 300
taaaccggac agtgaaatag ttgaccacta cacatatgtc atccttgg 348

<210> 557
<211> 369
<212> DNA
<213> Eucalyptus grandis

<400> 557
cctgtaacga cgaggtcatg aggtacaacc ccaagagccc ctactggttc aaccgcgacc 60
ggttcgtgct gtcggccggg cacggttgca tgctgcagta cgcccttatg catctcgctg 120
ggtatgacag cgtccaggag gaagacttga aaggcttccg gcagtgggga agcaagaccc 180
ctggccatcc ggagaacttt gagacaaccg gtatcgaagt tacaacaggt ccactcgggc 240
aaggaattgc caatgctgtt ggtttggcac tcgtagagaa gcatttggct gctcgcttca 300
ataaaccgga cagtgaaata gttgaccact acacatatgt atccttggag atggttgcca 360
gatggaggg 369

<210> 558
<211> 470
<212> DNA
<213> Eucalyptus grandis

<400> 558
cgggcaagga attgccaatg ctgttggttt ggcactcgta gaagcatttg gctgctcgct 60
tcaataaacc ggacagtgaa atagttgacc actacacata tgtcatcctt ggagatggtt 120
gccagatgga gggtatttcc aatgaagctt gttcacttgc tggtcactgg ggacttggaa 180
agttgattgc tttctatgac gacaaccaca tctctatcga tggtgatacg gaaattgcat 240
tcaccgagag tgttgacacc cgtttcgagg gtcttgggtg gcatgtcata tgggtgaaaa 300
acggaaacac tggctatgat gagatacgtg ctgctattaa ggaagcgaag gctgtcaagg 360
ataagcctac attaattaag gtgactacca ccattggcta cggttcacct acaaggacaa 420
ctcatatagt gtgcatggga gcgcactggg tgccaaggaa gtcgatgcac 470

<210> 559
<211> 356
<212> DNA
<213> Eucalyptus grandis

<400> 559
gtgaacactg gttatgatga aattcgtgct gccatcaaag aagcaaaggc tgttaaagac 60
aagcctactt tgattaaggt aactacgacc ataggttatg gttcacctaa caagtccaac 120
agctacagtg tgcatggtag tgcactgggc gccaaggaag ttgatgcaac taggaataac 180
cttggttggc catatgagcc tttccatgtg cctgaggatg ttaaaaagca ctggagtcgc 240
catactcctg ttggtgctgc cgttgaagct gaatggaatg caaaatttgc tgaatatgag 300
aagaaataca aggatgaagc tgcagtgctg aaatctatca ttaagggcga actacc 356

<210> 560
<211> 447
<212> DNA
<213> Eucalyptus grandis

<400> 560
gttgccagat ggagggtatt tccaatgaag cttgttcact tgctggtcac tggggacttg 60
gaaagttgat tgctttctat gacgacaacc acatctctat cgatggcgat acggaaattg 120
cattcaccga gagtgttgac acccgtttcg agggtcttgg ttggcatgtc atatgggntg 180
aaaaacggaa acactggcta tgatgaaata cgtgctgcta ttaaggaagc gaaggctgtc 240
aaggataagc ctacattaat taaggtgact accaccattg gctacggttc acctaacaag 300
gccaactcat atagtgtgca tgggagcgca ctgggtgcca aggaagttga tgcaacaagg 360
aagaaccttg gttggccata tgaacctttc catgtgcctg aggatgtcaa agcgcactgg 420
agtcgccatg tccctgctgg cgctgct 447

<210> 561
<211> 398
<212> DNA
<213> Eucalyptus grandis

<400> 561
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tgtgcatggt agtgcactgg gcgccaagga agttgatgca actaggaata accttggttg 120
gccatatgag cctttccatg tgcctgagga tgttaaaaag cactggagtc gccatactcc 180
tgttggtgct gctgttgaag ctgaatggaa tgcaaaattt gctgaatatg agaagaaata 240
caaggatgaa gctgcagtgc tgaaatctat cattaagggt gaactacctg ctggttggga 300
gaaagccctg ccgacgtaca ccccagagat tccagcagat gctaccagaa acctctctna 360
acaatgcctc aatgcccttg tggatgtggt gcctggtc 398

<210> 562
<211> 406
<212> DNA
<213> Eucalyptus grandis

<400> 562
gacacctggg catcctgaga acttcgagac gcccggtatt gaagttacga caggtccact 60
tggccaagga atcgccaatg ctgttggttt ggctcttgcc gagaaacatt tggctgctcg 120
tttcaacaaa ccggacaatg aaattgtcga ccactacaca tatgccgttc ttggagatgg 180
atgtcaaatg gaaggcattg cgaatgaagc ttgttccctc gctgggcact ggggacttgg 240
gaagctgatt gccttttatg atgacaacca catctccatt gatggtaaca cagagattgc 300
attcaccgag aatgttgaga aacgttttga gggtctgggt tggcatgtta tatgggtgaa 360
aaatggtaac actggttatg atgaaattcg tgctgccatc aaagaa 406

<210> 563
<211> 413
<212> DNA
<213> Eucalyptus grandis

<400> 563
atggaatgcc aagtttgccg agtatgagaa gaagtacaag gaagaagctg cagaactgaa 60
gtccattttc aagggtgaac tgcctgctgg ttgggaaaaa gcacttccga cgtatactcc 120
tgagagtcct gctgatgcca ccaggaatct ctctcagcaa tgcctgaatg ccctcgctaa 180
agtgctgcct ggtcttcttg gtggcagtgc tgatcttgct tcttccaaca tgacactgct 240
taagatgttc ggtgatttcc aaaagggcac ccggaggaa cgcaatgtca ggttcggtgt 300
tagagagcat ggaatgggag ctatttgcaa cgggattgcc ctgcacagcc ctggtctcat 360
tccatactgc gccacgttct ttgtcttcac tgactacatg anggctgcga tga 413

<210> 564
<211> 398
<212> DNA
<213> Eucalyptus grandis

<400> 564
gccatactcc tgttggtgct gccgttgaag ctgaatggaa tgcaaaattt gctgaatatg 60
agaagaaata caaggatgaa gctgcagtgc tgaaatctat cattaagggc gaactacctg 120
ctggttggga gaaagccctg ccgacgtaca ccccagagat tccagcagac gctaccagaa 180
acctctctca acaatgcctc aatgcccttg tggatgtggt gcctggtctt cttggtggaa 240
gtgcagatct tgcttcctcc aacatgactc ttctcaaaaa gttcggcaat ttccaaaagg 300
ataccccctga ggaacgtaat gttagatttg gtgttaggga gcatggaatg gggccatct 360
gcaatgggat tgctctccat agcccaggac ttatcccg 398

<210> 565

<211> 376
<212> DNA
<213> Eucalyptus grandis

<400> 565
gctgaatgga atgccaagtt tgccgagtat gagaagaagt acaaggaaga agctgcagaa 60
ctgaagtcca ttttcaaggg tgaactgcct gctggttggg aaaaagcact tccgacgtat 120
actcctgaga gtcctgctga tgccaccagg aatctctctc agcaatgcct gaatgccctc 180
gctaaagtgc tgcctggtct tcttggtggc agtgctgatc ttgcttcttc caacatgaca 240
ctgcttaaga tgttcggtga tttccaaaag ggcacccccgg aggaacgcaa tgtcaggttc 300
ggtgttagag agcatggaat gggagctatt tgcaacggga ttgccctgca cagccctggt 360
ctcattccat actgcg 376

<210> 566
<211> 327
<212> DNA
<213> Eucalyptus grandis

<400> 566
gccatactcc tgttggtgct gccgttgaag ctgaatggaa tgcaaaattt gctgaatatg 60
agaagaaata caaggatgaa gctgcagtgc tgaaatctat cattaagggc gaactacctg 120
ctggttggga gaaagccctg ccgacgtaca ccccagagat tccagcagac gctaccagaa 180
acctctctca acaatgcctc aatgcccttg tggatgtggt gcctggtctt cttggtggaa 240
gtgcagatct tgcttcctcc aacatgactc ttctcaaaaa gttcggcaat ttccaaaagg 300
ataccccctga ggaacgtaat gttagat 327

<210> 567
<211> 346
<212> DNA
<213> Eucalyptus grandis

<400> 567
gacacctggg catcctgaga acttcgagac gcccggtatt gaagttacga caggtccact 60
tggccaagga atcgccaatg ctgttggttt ggctcttgcc gagaaacatt tggctgctcg 120
tttcaacaaa ccggacaatg aaattgtcga ccactacaca tatgccgttc ttggagatgg 180
atgtcaaatg gaaggcattg cgaatgaagc ttgttccctc gctgggcact ggggacttgg 240
gaagctgatt gccttttatg atgacaacca catctccatt gatggtaaca cagagattgc 300
attcaccgag aatgttgaga aacgttttga gggtctgggt tggcat 346

<210> 568
<211> 296
<212> DNA
<213> Eucalyptus grandis

<400> 568
gacacctggg catcctgaga acttcgagac gcccggtatt gaagttacga caggtccact 60
tggccaagga atcgccaatg ctgttggttt ggctcttgcc gagaaacatt tggctgctcg 120
tttcaacaaa ccggacaatg aaattgtcga ccactacaca tatgccgttc ttggagatgg 180
atgtcaaatg gaaggcattg cgaatgaagc ttgttccctc gctgggcact ggggacttgg 240
gaagctgatt gccttttatg atgacaacca catctccatt gatggtaaca cagaga 296

<210> 569
<211> 359
<212> DNA
<213> Eucalyptus grandis

<400> 569

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taacactggt tatgatgaaa ttcgtgctgc catcaaagaa gcaaaggctg ttaaagacaa 120
gcctactttg attaaggtaa ctacgaccat aggttatggt tcacctaaca agtccaacag 180
ctacagtgtg catggtagtg cactgggcgc caaggaagtt gatgcaacta ggaataacct 240
tggttggcca tatgagcctt tccatgtgcc tgaggatgtt aaaaagcact ggagtcgcca 300
tactcctgtt ggtgctgctg ttgaagctga atggaatgca aaatttgctg aatatgaga 359

<210> 570
<211> 394
<212> DNA
<213> Eucalyptus grandis

<400> 570
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ctctccatag cccaggactt atcccgtact gtgccacctt ctttgtcttc acagactaca 120
tgagggcagc gatgaggatc tctgcgcttg ctgaatctgg ggtcatctac gtcatgaccc 180
acgattctat tggtcttgga gaggatgggc ccacgcatca gccagttgag cacttggcta 240
gcttccgtgc tatgccaaac attctaatgc tccgcccagc tgatgggaat gaaactgctg 300
gtgcatacaa ggttgctatt gtaaacagga agagaccttc cgtcctcgct ctctccaggc 360
aaaagcttcc caaccttcct ggaacctcca tcga 394

<210> 571
<211> 349
<212> DNA
<213> Eucalyptus grandis

<400> 571
gttatggttc acctaacaag tccaacagct acagtgtgca tggtagtgca ctgggcgcca 60
aggaagttga tgcaactagg aataaccttg gttggccata tgagcctttc catgtgcctg 120
aggatgttaa aaagcactgg agtcgccata ctcctgttgg tgctgctgtt gaagctgaat 180
ggaatgcaaa atttgctgaa tatgagaaga aatacaagga tgaagctgca gtgctgaaat 240
ctatcattaa gggtgaacta cctgctggtt gggagaaagc cctgccgacg tacaccccag 300
agattccagc agacgctacc agaaacctct ctcaacaatg cctcaatgc 349

<210> 572
<211> 388
<212> DNA
<213> Eucalyptus grandis

<400> 572
tatcgatggc gatacggaaa ttgcattcac cgagagtgtt gacacccgtt tcgagggtct 60
tgggtggcat gtcatatggg tgaaaaacgg aaacactggc tatgatgaga tacgtgctgc 120
tattaaggaa gcgaaggctg tcaaggataa gcctacatta attaaggtga ctaccaccat 180
tggctacggt tcacctaaca aggccaactc atatagtgtg catggagcg cactgggtgc 240
caaggaagtc gatgcaacaa ggaagaacct tggttggcca tatgaacctt tccatgtgcc 300
tgaggatgtc aaagcgcact ggagtcgcca tgtccctgct ggcgctgcta ttgaagctga 360
atggaatgcc aagtttgccg agtatgag 388

<210> 573
<211> 342
<212> DNA
<213> Eucalyptus grandis

<400> 573
cttttatgat gacaaccaca tctccattga tggtaacaca gagattgcat tcaccgagaa 60
tgttgagaaa cgttttgagg gtctgggttg gcatgttata tgggtgaaaa atggtaacac 120
tggttatgat gaaattcgtg ctgccatcaa agaagcaaag gctgttaaag acaagcctac 180

tttgatggca gcacgaccat aggttatggt tcacctaaca agtccaacag ctacagtgtg 240
catggtaagt gcactgggcg ccaaggaagt tgatgcaact aggaataacc ttggttggcc 300
atatgagcct ttccatgtgc ctgaggatgt taaaaagcac tg 342

<210> 574
<211> 526
<212> DNA
<213> Pinus radiata

<400> 574
cttggtcaag gaattgccaa tgcagttggt ttggcacttg ctgagaaaca tctagcggct 60
agatacaata agccagactc cactattgtt gatcattaca catattgtat tgttggtgat 120
ggctgccaaa tggagggtat ttccaatgag gcctgctcgc ttgctggaca ctggggcctt 180
ggaaagctga ttgctttcta tgatgacaac cacatctcca tagatggtga cactgagatt 240
gcattcacag aggatgttat tactcgtttt gaaggtctgg gatggcacac tatctgggtg 300
aagaatggaa atacaggtta tgatgaaatt cgagctgcta ttgaggaggc caaatctgtg 360
aaggatagac caactttaat taagttcact actaccattg gctatgggtc accaaataag 420
gcaaacagtt acagtgtaca tggaagtgct ttgggtgcaa aggaggttga tgcaaccagg 480
cagaatctgg gttggcctca tccgccttcc acgtaccaga ggaggt 526

<210> 575
<211> 295
<212> DNA
<213> Pinus radiata

<400> 575
ggaaaatttg agatcctggt gtggtaatca caatggtacc attggtcaat gaatgtcaat 60
gcagttggtt tggcacttgc tgagaaacat ctagcagcta gatacaataa gccagactcc 120
actattgttg atcattacac atattgtatt gttggtgatg gctgccaaat ggagggtatt 180
tccaatgagg cgtgctcgct tgctggacac tggggccttg gaaagctgat tgctttctat 240
gatgacaacc acatctccat agatggtgac actgagattg cattcacaga ggtgt 295

<210> 576
<211> 481
<212> DNA
<213> Pinus radiata

<400> 576
gcaatctccg ttttggagtg cgtgaacatt ccatgggagc tatctgcaat gggatagccc 60
ttcatggaag tggcctcatt ccttattgtg ctactttctt tgttttcaca gactacatga 120
gagcagctat tagaatctct gcactctctg aagctggtgt tatctatgtn atgacccatg 180
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cttacaaggt tgctgttctc aatagaaaga ggccatcaat acttgctctc tcccgtcaaa 360
aactcccaca tcttgccggt tcttcaatag agggtgttga gaagggaggt acattatcag 420
tgacaattcc tctggcaaca agcctgatgt cattcttatg ggtagtggtc tgagcttgag 480
a 481

<210> 577
<211> 407
<212> DNA
<213> Pinus radiata

<400> 577
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ttcatggaag tggcctcatt ccttattgtg ctactttctt tgttttcaca gactacatga 120
gagcagctat tagaatctct gcactctctg aagctggtgt tatctatgta atgacccatg 180

attctattgg tctcggagaa gatgggccca ctcatcaacc aatagagcac ttggcgagct 240
ttagggcaat gcccaatgtt ttgatgttcc gtccagctga tggaaaggag acagctggag 300
cttacaaggt tgctgttctc aatagaaaga ggccatcaat acttgctctc tcccgtcaaa 360
aactcccaca tcttgccggt tcttcaatag agggtgttga gaagggg 407

<210> 578
<211> 332
<212> DNA
<213> Pinus radiata

<400> 578
ctgctcgctt gctggacact ggggccttgg aaagctgatt gctttctatg atgacaacca 60
catctccata gatggtgaca ctgagattgc attcacagag gatgttatta ctcgttttga 120
aggtctggga tggcacacta tctgggtgaa gaatggaaat acaggttatg atgaaattcg 180
agctgctatt gaggaggcca aatctgtgaa ggatagacca actttaatta agttcactac 240
taccattggc tatgggtcac caaataaggc aaacagttac agtgtacatg gaagtgcttt 300
gggtgcaaag gaggttgatg caaccaggca ga 332

<210> 579
<211> 500
<212> DNA
<213> Pinus radiata

<400> 579
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tgctactttc tttgttttca cagactacat gagagcagct attagaatct ctgcactctc 120
tgaagctggt gttatctatg taatgaccca tgattctatt ggtctcggag aagatgggcc 180
cactcatcaa ccaatagagc acttggcgag ctttagggca atgcccaatg ttttgatgtt 240
ccgtccagct gatggaaagg agacagctgg agcttacaag gttgctgttc tcaatagaaa 300
gaggccatca atacttgctc tctcccgtca aaaactccca catcttgccg gttcttcaat 360
agagggtgtt gagaagggag gctacattat cagtgacaat tcctctggca acaagcctga 420
tgtcattctt atgggtagtg gttctgagct tgagattgct gagaaagctg catctacttt 480
gaggaatgaa gggaaagctg 500

<210> 580
<211> 465
<212> DNA
<213> Pinus radiata

<400> 580
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attgttgatc attacacata ttgtattgtt ggtgatggct gccaaatgga gggtatttcc 120
aatgaggcct gctcgcttgc tggacactgg ggccttggaa agctgattgc tttctatgat 180
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cgttttgaag gtctgggatg gcacactatc tgggtgaaga atggaaatac aggttatgat 300
gaaattcgag ctgctattga ggaggccaaa tctgtgaagg atagaccaac tttaattaag 360
ttcactacta ccattggcta tgggtcacca aataaggcaa acagttacag tgtacatgga 420
agtgctttgg tgcaaaggag gttgatgcaa ccaggcagaa tctgg 465

<210> 581
<211> 494
<212> DNA
<213> Pinus radiata

<400> 581
ccggtatata ctccggagag tcctgctgat gctactcgaa atctatctca acaatgtttg 60
aatgcacttg tgagggttct tcccggactt ttgggtggaa gtgcagacct tgcatcatcc 120

aacatgacat tattaaaaat gtttggtgac ttccagaagg ataccccctgc tgagcgcaat 180
ctccgttttg gagtgcgtga acattccatg ggagctatct gcaatgggat agcccttcat 240
ggaagtggcc tcattcctta ttgtgctact ttctttgttt tcacagacta catgagagca 300
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attggtctcg gagaagatgg gcccactcat caaccaatag agcacttggc gagctttagg 420
gcaatgccca atgttttgat gttccgtcca gctgatggaa aggagacagc tggagcttac 480
aaggtgctgt tctc 494

<210> 582
<211> 505
<212> DNA
<213> Pinus radiata

<400> 582
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gctatctgca atgggatagc ccttcatgga agtggcctca ttccttattg tgctactttc 120
tttgttttca cagactacat gagagcagct attagaatct ctgcactctc tgaagctggt 180
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agaagggagg ctacattatc agtgacaatt cctctggcaa caagcctgat gtcattctta 480
tgggtagtgg ttctgagctt gagat 505

<210> 583
<211> 399
<212> DNA
<213> Pinus radiata

<400> 583
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gctatctgca atgggatagc ccttcatgga agtggcctca ttccttattg tgctactttc 120
tttgttttca cagactacat gagagcagct attagaatct ctgcactctc tgaagctggt 180
gttatctatg taatgaccca tgattctatt ggtctcggag aagatgggcc cactcatcaa 240
ccaatagagc acttggcgag ctttagggca atgcccaatg ttttgatgtt ccgtccagct 300
gatggaaagg agacagctgg agcttacaag gttgctgttc tcaatagaaa gaggccatca 360
atacttgctc tcttccgtca aaaactccca catcttgcc 399

<210> 584
<211> 472
<212> DNA
<213> Pinus radiata

<400> 584
aaatggaggg tatttccaat gaggcctgct cgcttgctgg acactggggc cttggaaagc 60
tgattgcttt ctatgatgac aaccacatct ccatagatgg tgacactgag attgcattca 120
cagaggatgt tattactcgt tttgaaggtc tgggatggca cactatctgg gtgaagaatg 180
gaaatacagg ttatgatgaa attcgagctg ctattgagga ggccaaatct gtgaaggata 240
gaccaacttt aattaagttc actactacca ttggctatgg gtcaccaaat aaggcaaaca 300
gttacagtgt acatggaagt gctttgggtg caaaggaggt tgatgcaacc aggcagaatc 360
tgggttggcc tcatccgcct ttccacgtac cagaggaggt taagagtcac tggagtaggc 420
atgtgccaaa gggtgcagcg tttgaagcaa agtggtcatc taaatttgcc ga 472

<210> 585
<211> 531
<212> DNA
<213> Pinus radiata

<400> 585
aaaacattgg gcattgccct aaagctcgcc aagtgctcta ttggttgatg agtgggccca 60
tcttctccga gaccaataga atcatgggtc attacataga taacaccagc ttcagagagt 120
gcagagattc taatagctgc tctcatgtag tctgtgaaaa caaagaaagt agcacaataa 180
ggaatgaggc cacttccatg aagggctatc ccattgcaga tagctcccat ggaatgttca 240
cgcactccaa aacggagatt gcgctcagca ggggtatcct tctggaagtc accaaacatt 300
tttaataatg tcatgttgga tgatgcaagg tctgcacttc cacccaaaag tccgggaaga 360
accctcacaa gtgcattcaa acattgttga gatagatttc gagtagcatc agcaggactc 420
tccggagtat ataccggcag agccttatcc caccсttcag gcaatttacc actaattagt 480
gccttgaact cagcagcctc ctcgggatat ttcttctcat gttcggcaaa t 531

<210> 586
<211> 385
<212> DNA
<213> Pinus radiata

<400> 586
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gtggaagtca caactggacc acttggtcaa ggaattgcca atgcagttgg tttggcactt 120
gctgagaaac atctagcggc tagatacaat aagccagact ccactattgt tgatcattac 180
acatattgta ttgttggtga tggctgccaa atggagggta tttccaatga ggcctgctcg 240
cttgctggac actggggcct tggaaagctg attgctttct atgatgacaa ccacatctcc 300
atagatggtg acactgagat tgcattcaca gaggatgtta ttactcgttt tgaaggtctg 360
ggatggcaca ctatctgggt gaaga 385

<210> 587
<211> 314
<212> DNA
<213> Eucalyptus grandis

<400> 587
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cggcaaaggc gattgtcaac aatctcatct acctcctana cacatatggc catgtcctaa 180
atggtgcgag ggtctactac acgaaccgga gccaacctcc ccttctgagt gcaatgattc 240
gtgccatcta tgaaaagaca catgacaagg aatttgtcgt gaagtctctc cctgctcttc 300
tgaaagagca tgat 314

<210> 588
<211> 479
<212> DNA
<213> Eucalyptus grandis

<400> 588
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gaattttatt attgggattc gtattggatc atcaaaggtc ttctcacgag tggaatgaat 180
attactgcga aaggaattat attaaatgct cttgatctca ttaaagaata tggatttatt 240
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gtcagatatt attacgatta tactcaggat atggaactat taagagaagc agtcccaatc 360
ctcgacaaag aatacaaata ttggatgaaa acccactcag ttaacttgcc tggaggatac 420
gctcttaatc gatttttctc cgatagtgat aaacctcgtc ctgaatctta cagagaaga 479

<210> 589
<211> 362
<212> DNA

<213> Eucalyptus grandis

<400> 589
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agtcgttatt acgcaatgtg ggataaaccc aggcccgaat cttcaacaat cgacaaggag 180
tctgcttcaa atatatcaag cacttctgaa aagcagaagt tctatcggga agtagcttcg 240
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acgttggcaa caacatcaat tttaccggtt gatttgaaca tatacatact aaggatggaa 360
ct 362

<210> 590
<211> 190
<212> DNA
<213> Pinus radiata

<400> 590
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gattgtcaac aatcttgttt cacttataca taaatatgga tttgtcctaa atggtgcacg 120
gacttactat acgaacagaa gtcaacctcc tctcctaagt gccatggtac gggccattta 180
catgaaaaca 190

<210> 591
<211> 301
<212> DNA
<213> Pinus radiata

<400> 591
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gacttactat acgaacagaa gtcaacctcc tctcctaagt gccatggtac gggccattta 180
catgaaaaca ggggatattg atctattaaa aatggcattc ccaactttgt tacaggaaca 240
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c 301

<210> 592
<211> 468
<212> DNA
<213> Eucalyptus grandis

<400> 592
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ctgctcggcg gcatccgggc caccgtcgtc gacaacctgg acaactcctc ggaaatcgcc 180
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gataacaatc ttattgggac aattacttta ctagaagtga tggcttccca tgaatgtaaa 420
aagcttgttt tctcgtcatc tgcacagttt atggctggcc taaggagg 468

<210> 593
<211> 601
<212> DNA
<213> Eucalyptus grandis

<400> 593
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ccagcgtcct cgtcaccggc ggctgcgggt acattgggag ccacaccgtg ctccagctcc 120
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gaggagtttc ccctttgtgc tacgaatcca tatggacgaa ccaagctaat tatcgaagat 540
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t 601

<210> 594
<211> 239
<212> DNA
<213> Eucalyptus grandis

<400> 594
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gagatggttg ctgcatttga gaaggcatct ggaaaggnaa ttcctcttgt aatggctgga 180
agaagacctg gcgatgcgga aattgtgtat gcttcgacag agaaagctga gcgcgaatt 239

<210> 595
<211> 388
<212> DNA
<213> Eucalyptus grandis

<400> 595
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cgccggctac atcggcagcc acacggtgct ccagctcctc ctcggcggcc accgcgtcgt 120
cgtcgtcgac aacctcgaca actcctcccc cgccgccctc gaccgggtcc gcgacctcgc 180
cggcgagcgc ggccccaacc tctccttcca cgaggttgac ctccgagaca aaccggcgct 240
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agtaggtgaa agtgtgcaga agccgctgct ttatttcaac aataacctca atgggaccat 360
catcttgctg gaagtcatgg ctgctcat 388

<210> 596
<211> 454
<212> DNA
<213> Eucalyptus grandis

<400> 596
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tttgtgcagc aagttgctgt cggaagacga cctgctttga cagtttatng naacagacta 180
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acacattgct gcattgcaaa agcttgaaga acccggcata gggtgtgagg tgtataatct 300
gggaacaggg aagggaactt cagtcttgga gatggttgct gcatttgaga aggcatctgg 360
aaagaaaatt ccactcgtta aggctgggcg ccgaccaggt tgatgctgaa attgtatatg 420
catcaacaga aaaggctgaa cacgaattga actg 454

<210> 597
<211> 443
<212> DNA
<213> Eucalyptus grandis

<400> 597

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tccgcgacct cgccggcgag cgcggcccca acctctcctt ccacgaggtt gacctccgag 180
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ctggattgaa agcagtaggt gaaagtgtgc agaagccgct gctttatttc aacaataacc 300
tcaatgggac catcatcttg ctggaagtca tggctgctca tggatgtaag aagcttgtgt 360
tttcctcatc tgctactgtt tacggttggc caaaggaggt cccatgtaca gaggacttcc 420
ctgtttctgc cacgaatcca tat 443

<210> 598
<211> 268
<212> DNA
<213> Eucalyptus grandis

<400> 598
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ccgccctcga ccgggtccgc gacctcgccg gcgagcgcgg ccccagcctc tccttccacg 180
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ctgtcataca ctttgctgga ttgaaagc 268

<210> 599
<211> 437
<212> DNA
<213> Eucalyptus grandis

<400> 599
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gacaacctcg acaactcctc cccgccgcc ctcgaccggn tcccgnnacc tcgccggcga 180
gcgcggcccc aacctctcct tccacgaggt tgacctccga gacaaaccgg cgctggagaa 240
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ttacggttgg ccaaagg 437

<210> 600
<211> 578
<212> DNA
<213> Eucalyptus grandis

<400> 600
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tcaacagaaa aggctgaaca cgaattgaac tggaaggcca aatatggcat tgaggagatg 480
tgcccgagat caatggaact gggccagcaa gacccttatg gctatggatc ccccgactcg 540
actgactgat agcttaggat tttggcattc tcgtatta 578

<210> 601
<211> 160
<212> DNA
<213> Eucalyptus grandis

<400> 601
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ttggtgcaca tcctagtggc tccattggtg aggatcccag gggatccca aacaatctaa 120
tgccatttgt acagcaagtt gctgtcggaa gacgacctgc 160

<210> 602
<211> 381
<212> DNA
<213> Eucalyptus grandis

<400> 602
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catatttggc cttccagttc aattcgtgtt cagccttttc tgttgatgca tatacaattt 180
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cacaccctat gccgggttct tcaagctttt gcaatgcagc aatgtgtcca tcggctagat 360
caacaacatg gatgtaatca c 381

<210> 603
<211> 357
<212> DNA
<213> Eucalyptus grandis

<400> 603
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ggcagccaca cggtgctcca gctcctcctc ggcggccacc gcgtcgtcgt cgtcgacaac 120
ctcgacaact cctcccccgc cgccctcgac cgggtccgcg acctcgccgg cgagcgcggc 180
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gtgcagaagc cgctgcttta tttcaacaat aacctcaatg ggaccatcat cttgctg 357

<210> 604
<211> 315
<212> DNA
<213> Eucalyptus grandis

<400> 604
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gggatcccaa acaatctaat gccatttgtg cagcaagttg ctgttggaag acgacctgct 120
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gctgcatttg agaag 315

<210> 605
<211> 368
<212> DNA
<213> Eucalyptus grandis

<400> 605
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gacggcgaaa tacactgatc ttcaagagag cttgggtatt gcatggagat ggcaaaaggc 360
acaccgca 368

<210> 606
<211> 545
<212> DNA
<213> Eucalyptus grandis

<400> 606
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aaccggcgct ggagaaattg ttctcctcga ccaaatttga tgctgtcata cactttgctg 120
gattgaaagc agtaggtgaa agtgtgcaga agccgctgct ttatttcaac aataacctca 180
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caacg 545

<210> 607
<211> 356
<212> DNA
<213> Eucalyptus grandis

<400> 607
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gtcatacact ttgctggatt gaaagcagta ggtgaaagtg tgcagaagcc gctgct 356

<210> 608
<211> 462
<212> DNA
<213> Eucalyptus grandis

<400> 608
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cgccggctac atcggcagcc acacggtgct ccagctcctc ctcggcggcc accgcgtcgt 180
cgtcgtcgac aacctcgaca actcctcccc cgccgccctc gaccgggtcc gcgacctcgc 240
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<210> 609
<211> 362
<212> DNA
<213> Eucalyptus grandis

<400> 609
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tttcaacaat aacctcaatg ggaccatcat cttgctggaa gtcatggctg ctcatggatg 360
ta 362

<210> 610
<211> 399
<212> DNA
<213> Eucalyptus grandis

<400> 610
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<210> 611
<211> 363
<212> DNA
<213> Eucalyptus grandis

<400> 611
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ctg 363

<210> 612
<211> 457
<212> DNA
<213> Eucalyptus grandis

<400> 612
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acggttggcc aaaggaggtc ccatgtacag aggactt 457

<210> 613
<211> 383
<212> DNA
<213> Pinus radiata

<400> 613
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ggatggctac gaggtttata tcatcgacaa tttagataac tctgttgaag aagcagtgaa 180

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tctttgcaac aaagagggat gtagagaagg ttttttcatt ggccaaattc gatgctgtga     300
tacattttgc tggattgaag gctgttggga gaaagtgtag caattccatt acgtaattac     360
caaggaaaaa atctagttgg gca                                             383
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<210> 614
<211> 517
<212> DNA
<213> Pinus radiata

<400> 614

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agccacaccg ccctgcagct cctcgaggat ggctacgagg tttatatcat cgacaattta     180
gataactctg ttgaagaagc agtccacaca gtgagggatt tagttgatca gcgcttccgc     240
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tcattggcca aattcgatgc tgtgatacat tttgctggat tgaaggctgt tggagaaagt     360
gtagcaattc cattacgtta ttacaagaac aatctagttg gcactctgaa cctatatgag     420
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<210> 615
<211> 473
<212> DNA
<213> Pinus radiata

<400> 615

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gaggcatgtt actctttaga tttttgaagt ttttgggcta atacagagcg atagtgagca     180
tggagtgcca aggaaagaac attctggtca ccggaggagc aggttatgtt ggcagtcaca     240
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cttcagaaga agctattaca agagttgcta agctcgctgg cgaatatggg ggcaatctca     360
ccttccataa gattgatctt ctgggtaaaa gaagctatgg agaaattgtt cttatcaaca     420
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<210> 616
<211> 323
<212> DNA
<213> Pinus radiata

<400> 616

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tggagctcac ccaagtggcc agattggtga agatccaaag ggaattccaa ataacctcat     180
gcctttcatc caacaagtgg ctgtgggaag gcaaccagtg ctgaacgtat atggtaatga     240
ttaccaaaca aaggatggca cagcggttcg agattacatt catgtggtag acttggctga     300
tggtcacatt tctgcgcttc aga                                             323
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<210> 617
<211> 497
<212> DNA
<213> Pinus radiata

<400> 617

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caccgccctg cagctcctcg aggatggcta cgaggtttat atcatcgaca atttagataa 180
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tcttcacttt tttctgggag atctttgcaa caaagaggat gtagagaagg ttttttcatt 300
ggccaaattc gatgctgtga tacattttgc tggattgaag gctgttggag aaagtgtagc 360
aattccatta cgttattaca agaacaatct agttggcact ctgaacctat atgagattat 420
ggccaacatg gttgcaaaaa gatggttttt tcatcatcag ctacagttat ggccaaccca 480
aggtgattcc ttgtgta 497

<210> 618
<211> 384
<212> DNA
<213> Pinus radiata

<400> 618
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<210> 619
<211> 354
<212> DNA
<213> Pinus radiata

<400> 619
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tgttcttatc aacagaattt gatgctgtca ttcattttgc tgggttgaaa gctgtcggag 300
agagtgtagc aaagccactg ctttactaca aaaacaacat agttggcacc ttaa 354

<210> 620
<211> 425
<212> DNA
<213> Pinus radiata

<400> 620
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gtgat 425

<210> 621
<211> 623
<212> DNA
<213> Eucalyptus grandis

<400> 621
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tgcggatgct gggcactcgg gga 623

<210> 622
<211> 426
<212> DNA
<213> Eucalyptus grandis

<400> 622
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tcttcttcaa tggctgtccc ggtcttttcc aaagtgtctg tgtcgttcgg cctgttcgtg 120
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ctggtc 426

<210> 623
<211> 412
<212> DNA
<213> Eucalyptus grandis

<400> 623
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gggtcttgcg ttgttggtgg gtctggtcgc gggtgcgagg tttgaggagc tctaccagcc 180
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gatcaagctc gtcgagggcg actcggctgg gaccgtcact gctttctaca tgtcgtcgga 360
tggaccgaac cacaacgaat tcgacttcga gtcctgggca aacgacaggg ga 412

<210> 624
<211> 373
<212> DNA
<213> Eucalyptus grandis

<400> 624
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ccggggcatc ccgtacccga aggaccagcc catgggcgtc tacagctcga tatggaacgc 120
cgacgactgg gccacccagg gcggccgcat caagaccgac tggacccacg ccccttcat 180
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agacaacgcc aagcggtgca gcagcgccgg cagggagagg cggtactggt gggacgcgcc 300
cacggtgtcc gagctgagcc tccaccagaa ccaccagctc aagtgggtcc aggcccanca 360
catggtctac gac 373

<210> 625
<211> 351
<212> DNA

<213> Eucalyptus grandis

<400> 625
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tcctactctg ttctctggaa catgtaccag attgtattct tcgtggatga cgtgccgatc 120
cgggtgttca agaacagcaa ggaccttggg gtgaaattcc ccttcaacca gccgatgaaa 180
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gactggtcca aggcgccgtt cgtggcctct taccgggggt tccacattga cgggtgcgaa 300
cgtcggttga ggccaagttc tgcgcaactc agggccaagg tggtgggacc a 351

<210> 626
<211> 270
<212> DNA
<213> Eucalyptus grandis

<400> 626
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ccagattgta ttcttcgtgg atgacgtgcc gatccgagtg ttcaagcaca gcaaggaacc 180
ttggggtgca attccccttc aaccagcccg atgaaattgt actccagcct gtggaatgcg 240
gatgactggg ccactcgggg agggcttgag 270

<210> 627
<211> 267
<212> DNA
<213> Eucalyptus grandis

<400> 627
gcctgtacta tagtgcagac caatgtgttc acgggaggaa aaggagacag agaacagagg 60
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taccagattg tattcttcgt ggatgacgtg ccgatccgag tgttcaagaa cagcaaggac 180
cttggggtga aattcccctt caaccagccg atgaaattgt actccagcct gtggaatgcg 240
gatgactggg ccactcggga ggcttga 267

<210> 628
<211> 468
<212> DNA
<213> Eucalyptus grandis

<400> 628
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ttcttcttct tcttcttcaa tggctgtccc ggtcttttcc aaagtgtctg tgtcgttcgg 120
cctgttcgtg ggtcttgcgt tgttggtggg tctggtcgcg ggtgcgaggt ttgaggagct 180
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gcttgacaac tactctggcg ctgggttcgg gtcgaagagc aagtacatgt tcggcaaagt 300
taccatccag atcaagctcg tcgagggcga ctcggctggg accgtnactg ctttctacat 360
gtcgtcggat ggaccgaacc acaacgaatt cgacttcgag ttcctgggca acacgacagg 420
ggagccctac ctggtaaaga ccaacgtgta cgtaaacggg gtgggcaa 468

<210> 629
<211> 559
<212> DNA
<213> Eucalyptus grandis

<400> 629
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cctgttcgtg ggtcttgcgt tgttggtggg tctggtcgcg ggtgcgaggt ttgaggagct 180
ctaccagccg ggctgggcta tggaccattt tgtctacgaa ggagaggttc tcaagctcaa 240
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ggagccctac ctggtacaga ccaacgtgta cgtgaacggg gtgggcaacc gggagcagaa 480
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caaccgccaa agtcgtgtt 559

<210> 630
<211> 416
<212> DNA
<213> Eucalyptus grandis

<400> 630
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ctgtcccggt cttttccaaa gtgtctgtgt cgttcggcct gttcgtgggt cttgcgttgt 120
tggtgggtct ggtcgcgggt gcaaggttta aggagctcta ccagccgggc tgggctatgg 180
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agggcgactc ggctgggacc gtcactgctt tctacatgtc gtcggatgga ccgaaccaca 360
acgaattcga cttcgagttc ctggggcaac acgacagggg aaccctacct ggtaca 416

<210> 631
<211> 250
<212> DNA
<213> Eucalyptus grandis

<400> 631
tggacgagac accgatccgc gtgcacacca acatggagca ccggggcatc ccgtacccga 60
aggaccagcc catgggcgtc tacagctcga tatggaacgc cgacgactgg gccacccagg 120
gcggccgcat caagaccgac tggacccacg ccccccttcat cacgtcctac cgtaacttcg 180
agatcgacgc gtgcgagtgc ccggcgacaa tggcggcggc agacaccgcc aagcggtgca 240
gcagcgccgg 250

<210> 632
<211> 475
<212> DNA
<213> Eucalyptus grandis

<400> 632
gagaaacaga gcgacttcag agctcgtgaa gaaaagcttt tgctctcgct cttcttcttc 60
ttcttcttct tcttcttcaa tggctgtccc ggtcttttcc aaagtgtctg tgtcgttcgg 120
cctgttcgtg ggtcttgcgt tgttggtggg tctggtcgcg ggtgcgaggt ttgaggagct 180
ctaccagccg ggctgggcta tggaccattt tgtctacgaa ggagaggttc tcaagctcaa 240
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gatccctacc tggtacagac caacgtgtac gtgaacgggg tgggaaccgg gacaa 475

<210> 633
<211> 416
<212> DNA
<213> Eucalyptus grandis

<400> 633
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tgggtcttgc gttgttggtg ggtctggtcg cgggtgcgag gtttgaggag ctctaccagc 180
cgggctgggc tatggaccat tttgtctacg aaggagaggt tctcaagctc aagcttgaca 240
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agatcangct cgtcgagggc gactcggctg ggaccgtcac tgctttctac atgtcgtcgg 360
atggaccgaa ccacaacgaa ttcgacttcg agttcctggg caacacgaca ggggag 416

<210> 634
<211> 232
<212> DNA
<213> Eucalyptus grandis

<400> 634
ggaaaaggag acagagaaca gaggatttat ctttggttcg atcccaccgc cgcctaccac 60
tcctactctg ttctctggaa catgtaccag attgtattct tcgtggatga cgtgccgatc 120
cgggtgttca agaacagcaa ggaccttggg gtgaaattcc ccttcaacca gccgatgaaa 180
ttgtactcca gcctgtggaa tgcggatgac ttgggcaatc cggggagggt tt 232

<210> 635
<211> 287
<212> DNA
<213> Eucalyptus grandis

<400> 635
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ccaaggcgcc gttcgtggcc tctgaccggg ggttccacat cgacgggtgc gaacgtcggt 120
tgaggccaag tgctgcgcta ctcagggcca gaggtggtgg gaccagaagg agttccagga 180
cctcgatgcc ttccagtacc ggaggctccg gtgggtgcgc tcgagataca ccatctacaa 240
ctactgcgct gatcggnaga ggtaccccgc gatntccccg gagtgca 287

<210> 636
<211> 240
<212> DNA
<213> Eucalyptus grandis

<400> 636
ggacgagaca ccgatccgcg tgcacaccaa cttggagcac cggggcatcc cgtacccgaa 60
ggaccagccc atgggcgtct acagctcgat atggaacgcc gacgactggg ccacccaggg 120
cggccgcatc aagaccgact ggacccacgc cccctcatc acgtcctacc gtaacttcga 180
gatcgacgcg tgcgagtgcc cggcgaccat ggcggcggca gacaacgcca agcggtgcag 240

<210> 637
<211> 360
<212> DNA
<213> Eucalyptus grandis

<400> 637
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caccaacgtg ttctcgcagg ggaaagggaa cagagaacag caatttcacc tctggttcga 120
tcccaccaag gcatttcaca cctactcgat cgtctggaac actcgacgca tcatgtaatg 180
tcccaaaagc tcatgacgaa gacctctttt tcctctctat acgaaactag aataccgctc 240
ctgttgctga ctaacccgcg aattcctatt tcagattctt ggtggacaac agtcccataa 300
gagtgttcaa caacttggga gtcgatcggc gtgcctttcc caagcaacca acccatgagg 360

<210> 638
<211> 401
<212> DNA

<213> Eucalyptus grandis

<400> 638
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gcttcgcccg cagctgggaa cttctaccag gacttcgacc tgacgtgggg tggcagcgac 180
cgggccaaga tcttcagcgg gggtcagctc ctgtcgctgt ccctcgacag agtgtcgggg 240
tcgggcttcc ggtccaagaa ggagtacctg ttcggccgga tcgacatgca gctcaagctc 300
gtcgccggga actccgccgg caccgtgacc gcttactact tgtcttcgca agggccaact 360
cacgacgaga tcgacttcga agttcctggg gaacctgagc g 401

<210> 639
<211> 461
<212> DNA
<213> Eucalyptus grandis

<400> 639
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catccagatc aagctcgtcg agggcgactc ggctgggacc gtcactgctt tctacatgtc 360
gtcggatgga ccgaaccaca acgaattcga cttcgagttc ctgggcaaca cgacagggga 420
gccctacctg gtacagacca acgtgtacgt gaacggggtg g 461

<210> 640
<211> 458
<212> DNA
<213> Eucalyptus grandis

<400> 640
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aatttccaca catactccgt catctggaag ccccagcaca tcatcttctt ggtagacaac 180
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atcaagacag actggtcgaa atcgcccttc acggcatact acaggaagtt ccaggccact 360
gcctgcacct ggtccacggg ctcgtcctcc tgtgagatcg gacggcccgc ttcctactct 420
ggatccacat ggaaaatcaa tgagctcgat gcctatgg 458

<210> 641
<211> 283
<212> DNA
<213> Eucalyptus grandis

<400> 641
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atcatattct cagtggacgg gactcccatc agagagttca agaacgcaga gtccatcggt 120
gttcccttcc ccaaggccca gcccatgagg atattctcga gcctctggaa cgcggacgac 180
tgggcgacca gaggcgggct cgtgaagacg gactggacac aagcgccctt cactgcttcc 240
taccggaact tcaacgccga taacgcctgc gtttggtcat ctg 283

<210> 642
<211> 385
<212> DNA
<213> Eucalyptus grandis

<400> 642
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aactcacgat gagattgact tcgagttcct ggggaacctg agcggcgacc cttacatcct 120
ccacaccaac gtcttcactc aagggaaggg caacagggag cagcagttct acctgtggtt 180
tgaccccacc agaaatttcc acacatactc cgtcatctgg aagccccagc acatcatctt 240
cttggtagac aacatcaccc atctctctct ctctctcccc cactctctct caagccaaaa 300
tataagccaa agtataagcc aaagtataga gcaatcatgg cccatgaagg tggaggtcct 360
agtgcttcct ccatggtggt gctcg 385

<210> 643
<211> 378
<212> DNA
<213> Eucalyptus grandis

<400> 643
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gcggcctccg gcaacttcaa caaggacttc gacatcacgt ggggtgatgg ccgtgcgcag 180
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cggtccaaga agcagtactt gttcgggaag attgacatgc agctcaaact cgtgcctggg 300
aactccgccg gcaccgtcac cgcctattac ctttcttctt tgggttctgc gcacgacgaa 360
atcgacttcg agtttctc 378

<210> 644
<211> 430
<212> DNA
<213> Eucalyptus grandis

<400> 644
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gcgttgttgg tgggtctggt cgcgggtgcg aggtttgagg agctctacca gccgggctgg 180
gctatggacc attttgtcta cgaaggagag gttctcaagc tcaagcttga caactactct 240
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ctcgtcgagg gcgactcggc tgggaccgtc actgccttct acatgtcgtc ggatggaccg 360
aaccacaacg aattcgactt cgagttcctg ggcaacacga caggggagcc ctacctggta 420
cagaccaacg 430

<210> 645
<211> 471
<212> DNA
<213> Eucalyptus grandis

<400> 645
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gcttcgcccg cagctgggaa cttctaccag gacttcgacc tgacgtgggg tggcagcgac 180
cgcgccaaga tcttcagcgg gggtcagctc ctgtcgctgt ccctcgacag agtgtcgggg 240
tcgggcttcc ggtccaagaa ggagtacctg ttcggccgga tcgacatgca gctcaagctc 300
gtcgccggga actccgccgg caccgtgacc gcttactact tgtcttcgca agggccaact 360
cacgatgaga ttgacttcga gttcctgggg aacctgagcg gcgaccctta catcctccac 420
accaacgtct tcactcaagg gaagggcaac agggagcagc agttctacct g 471

<210> 646
<211> 480
<212> DNA

<213> Eucalyptus grandis

<400> 646

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ggctttcgat cacatcaagt acttcaatgg tggctccgag atacagctct ccttggacaa     180
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aaactcagag cacgacgaaa tagactttga gttcttgggt aacaggagtg ggcagccgta     360
catagtgcag accaatgtgt tcacgggagg aaaaggagac agagaacaga ggatttatct     420
ttggttcgat cccaccgncg cctaccactc ctactctgtt ctctggaaca tgtaccagat     480
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<210> 647
<211> 284
<212> DNA
<213> Eucalyptus grandis

<400> 647

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cttgacaact actctggcgc tgggttcggg tcgaagagca agtacatgtt cggcaaagtt     180
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<210> 648
<211> 459
<212> DNA
<213> Eucalyptus grandis

<400> 648

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tctgcttctc gtggtcgttt cttgggggac gtttgcttcc gcccgcaact tctatcaaga     180
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caagattgac atgcagctca agctagttcc cggcaactcc gctggcaccg tcaccgcata     360
ctatttatct tcaaacgggt cggcgtggga tgagatagac ttcgagttct tggggaactt     420
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<210> 649
<211> 402
<212> DNA
<213> Eucalyptus grandis

<400> 649

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ctcgtcgagg gcgactcggc tgggaccgtc actgccttct acatgtcgtc ggatggaccg     360
aaccacaacg aattcgactt cgagttcctg ggcaacacga ca                        402
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<210> 650
<211> 469
<212> DNA
<213> Eucalyptus grandis

<400> 650
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ctacctggta cagaccaacg tgtacgtgaa cggggtgggc aaccgggag 469

<210> 651
<211> 473
<212> DNA
<213> Eucalyptus grandis

<400> 651
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gttcgtgggt cttgcgttgt tggtgggtct ggtcgcgggt gcgaggtttg aggagctcta 180
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gtcggatgga ccgaaccaca acgaattcga cttcgagttc ctgggcaaca cgacagggga 420
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<210> 652
<211> 454
<212> DNA
<213> Eucalyptus grandis

<400> 652
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catccagatc aagctcgtcg agggcgactc ggctgggacc gtcactgctt tctacatgtc 360
gtcggatgga ccgaaccaca acgaattcga cttcgagttc ctgggcaaca cgacagggga 420
gccctacctg gtacagacca acgtgtacgt gaac 454

<210> 653
<211> 435
<212> DNA
<213> Eucalyptus grandis

<400> 653
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gttcggcaaa gttaccatcc agatcaagct cgtcgaaggg cgactcggct gggaccgtca 180
ctgctttcta catgtcgtcg gatggaccga accacaacga attcgacttc gagttcctgg 240
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ccaacttgga gcacc 435

<210> 654

<211> 386
<212> DNA
<213> Eucalyptus grandis

<400> 654
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gcttcgcccg cagctgggaa cttctaccag gacttcgacc tgacgtgggg tggcagcgac 180
cgggccaaga tcttcagcgg gggtcagctc ctgtcgctgt ccctcgacag agtgtcgggg 240
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gtcgccggga actccgccgg caccgtgacc gcttactact tgtcttcgca agggccaact 360
cacgacgaga tcgacttcga gttcct 386

<210> 655
<211> 289
<212> DNA
<213> Eucalyptus grandis

<400> 655
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gcgggggtca gctcctgtcg ctgtccctcg acagagtgtc ggggtcgggc ttccggtcca 120
agaaggagta cctgttcggc cggatcgaca tgcagctcan gctcgtcgcc gggaactccg 180
ccggctccgt gaccgcttac tacttgtctt cgcaagggcc aactcacgac gagatcgact 240
tcgagttcct ggggaacctg agcggcgacc cttacatcct ccacaccan 289

<210> 656
<211> 422
<212> DNA
<213> Eucalyptus grandis

<400> 656
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gcaatcatgg cccatgaagg tggaggtcct agtgcttcct ccatggtggt gctcgtgagc 120
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acgtggggtg gcagcgaccg cgccaagatc ttcagcgggg gtcagctcct gtcgctgtcc 240
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gacatgcagc tcaagctcgt cgccgggaac tccgccggct ccgtgaccgc ttactacttg 360
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ga 422

<210> 657
<211> 445
<212> DNA
<213> Eucalyptus grandis

<400> 657
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tcttgtggac gagacaccga tccgcgtgca caccaacttg gagcaccggg gcatcccgta 240
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ccagggcggc cgcatcaaga ccgactggac ccacgccccc ttcatcacgt cctaccgtaa 360
cttcgagatc gacgcgtgcg agtgcccggc gaccatggcg gcggcagaca acgccaagcg 420
gtgcagcagc gccggcaggg agagg 445

<210> 658
<211> 310

<212> DNA
<213> Eucalyptus grandis

<400> 658
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tgtaccagat tgtattcttc gtggatgacg tgccgatccg ggtgttcaag aacagcaagg 120
accttggggt gaaattcccc ttcaaccagc cgatgaaatt gtactccagc ctgtggaatg 180
cggatgactg ggccactcgg ggagggcttg agaagaccga ctggtccaag gcgccgttcg 240
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gcgctactca 310

<210> 659
<211> 482
<212> DNA
<213> Eucalyptus grandis

<400> 659
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cctggtacag accaacgtgt acgtgaacgg ggtgggcaac cgggagcaga ggctcggcct 480
ct 482

<210> 660
<211> 415
<212> DNA
<213> Eucalyptus grandis

<400> 660
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catccagatc aagctcgtcg agggcgactc ggctgggacc gtcactgctt tctacatgtc 360
gtcggatgga ccgaaccaca acgaattcga cttcgagttc ctgggcaaca cgaca 415

<210> 661
<211> 542
<212> DNA
<213> Eucalyptus grandis

<400> 661
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cgaccgggcc aagatcttca gcgggggtca gctcctgtcg ctgtccctcg acagagtgtc 240
ggggtcgggc ttccggtcca agaaggagta cctgttcggc cggatcgaca tgcagctcaa 300
gctcgtcgcc gggaactccg ccggcaccgt gaccgcttac tacttgtctt cgcaagggcc 360
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ccacaccaac gtcttcactc aagggaaggg caacagggag cagcagttct acctgtggtt 480
tgaccccacc aggaatttcc acacatactc cgtcatctgg aagccccagc acatcatctt 540
ct 542

<210> 662
<211> 300
<212> DNA
<213> Eucalyptus grandis

<400> 662
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aagagcaagt acatgttcgg caaagttacc atccagatca agctcgtcga gggcgactcg 180
gctgggaccg tcactgcttt ctacatgtcg tcggatggac cgaaccacaa cgaattcgac 240
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<210> 663
<211> 424
<212> DNA
<213> Eucalyptus grandis

<400> 663
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tcggcaaagt taccatccag atcaagctcg tcgagggcga ctcggctggg accgtcactg 120
ctttctacat gtcgtcggat ggaccgaacc acaacgaatt cgacttcgag ttcctgggca 180
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gggagcagag gctcggcctc tggttcgacc ccaccactga cttccactcc tactccgtcc 300
tctggaacca gcgccaagtc gtgtttcttg tggacgagac accgatccgc gtgcacacca 360
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tatg 424

<210> 664
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<212> DNA
<213> Eucalyptus grandis

<400> 664
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aggcaagggc aaccgagagc agcaattcta tctctg 456

<210> 665
<211> 420
<212> DNA
<213> Eucalyptus grandis

<400> 665
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<210> 666
<211> 434
<212> DNA
<213> Eucalyptus grandis

<400> 666
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ggaccgaacc acaacgaatt cgacttcgag ttcctgggca acacgacagg ggagccctac 420
ctggtacaga ccaa 434

<210> 667
<211> 464
<212> DNA
<213> Eucalyptus grandis

<400> 667
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<210> 668
<211> 457
<212> DNA
<213> Eucalyptus grandis

<400> 668
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ttgtcttcgc aagggccaac tcacgatgag attgacttcg agttcctggg gaacctgagc 420
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<210> 669
<211> 434
<212> DNA
<213> Eucalyptus grandis

<400> 669
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gttcgatccc accg 434

<210> 670
<211> 294
<212> DNA
<213> Eucalyptus grandis

<400> 670
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aactacatgc ccacatgggc tttcgatcac atcaagtact tcaatggtgg ctccgagata 120
cagctctcct tggacaaata cacaggtact ggctttcaat ccaaggggtc ttacctgttc 180
gggcatttca gcatggacat caagttggtt gctggagatt ctgcagggac agtcactgca 240
ttctacctct catctcaaaa ctcagagcac gacgaaatag actttgagtt cttg 294

<210> 671
<211> 396
<212> DNA
<213> Eucalyptus grandis

<400> 671
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atcgacatgc agctcaagct cgtcgccggg aactccgccg gcaccgtgac cgcttactac 300
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<210> 672
<211> 287
<212> DNA
<213> Eucalyptus grandis

<400> 672
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cgggncgaag agcaagtaca tgttcggcaa agttaccatc cagatcaagc tcgncgaggg 180
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attcgacttc gagttcctgg gcaacacgac aggggagccc tacctgg 287

<210> 673
<211> 445
<212> DNA
<213> Eucalyptus grandis

<400> 673
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cttgcgttgt tggtgggtct ggtcgcgggt gcgaggtttg aggagctcta ccagccgggc 180
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aagctcgtcg agggcgactc ggctgggacc gtcactgctt tctacatgtc gtcggatgga 360
ccgaaccaca acgaattcga cttcgagttc ctgggcaaca cgacagggga gccctacctg 420
gtacagacca acgtgtaccg tgaac 445

<210> 674

<211> 387
<212> DNA
<213> Eucalyptus grandis

<400> 674
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cctccggcaa cttcaacaag gacttcgaca tcacgtgggg tgatggccgt gcgcagatac 180
ccagcagtgg ccagctcctc acgctgtccc tggacaagac gtcggggtcg ggcttccggt 240
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ccgccggcac cgtcaccgcc tattaccttt cttctttggg ttctgcgcac gacgaaatcg 360
acttcgagtt tctcggtaac ctgagcg 387

<210> 675
<211> 324
<212> DNA
<213> Eucalyptus grandis

<400> 675
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gggctcgtcc caccagtacc gcctctccct gccggcgctg ctgcaccgct tggcgttgtc 180
tgccgccgcc atggtcgccg ggcactcgca cgcgtcgatc tcgaagttac ggtaggacgt 240
gatgaagggg gcgtgggtcc agtcggtctt gatgcggccg cctgggtggc ccagtcgtcg 300
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<210> 676
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<212> DNA
<213> Eucalyptus grandis

<400> 676
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ttcctgtagt atgccgtgaa gggcgctttc gaccagtctg tcttgatcag tccgcctctc 180
gtggcccaat catcggcatt ccagaggctc gagtatattt tcatgggctg gttcttgggg 240
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<210> 677
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<212> DNA
<213> Eucalyptus grandis

<400> 677
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acaggggagc cctacctg 438

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<212> DNA

<213> Eucalyptus grandis

<400> 678
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ac 362

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<211> 424
<212> DNA
<213> Eucalyptus grandis

<400> 679
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tgac 424

<210> 680
<211> 414
<212> DNA
<213> Eucalyptus grandis

<400> 680
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<210> 681
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<212> DNA
<213> Eucalyptus grandis

<400> 681
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gtggcccaat catcggcatt ccagaggctc gagtatatct tcatgggctg gctcttgggg 180
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<210> 682
<211> 319
<212> DNA
<213> Eucalyptus grandis

<400> 682

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ctccttctgg tcccaccac 319

<210> 683
<211> 424
<212> DNA
<213> Eucalyptus grandis

<400> 683
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ggcc 424

<210> 684
<211> 309
<212> DNA
<213> Eucalyptus grandis

<400> 684
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acgtgaacg 309

<210> 685
<211> 238
<212> DNA
<213> Eucalyptus grandis

<400> 685
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gagctgtaga cgcccatggg ctggtccttc gggtacggga tgccccggtg ctccaagttg 180
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<210> 686
<211> 515
<212> DNA
<213> Eucalyptus grandis

<400> 686
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<210> 687
<211> 445
<212> DNA
<213> Eucalyptus grandis

<400> 687
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ggcccttgcg aagacaagta gtaag 445

<210> 688
<211> 422
<212> DNA
<213> Eucalyptus grandis

<400> 688
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ca 422

<210> 689
<211> 279
<212> DNA
<213> Eucalyptus grandis

<400> 689
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agaggttctc aagctcaagc ttgacaacta ctctggcgct gggttcgggt caaagagcaa 120
gtacatgttc ggcaaagtta ccatncagat caagctcgtc tagggcgact cggctgggac 180
cgtcactgct ttctacatgt cgtcggatgg accgaaccac aacgaattcg acttcgagtt 240
cctgggcaac acgacagggg agccctacct ggtacagac 279

<210> 690
<211> 452
<212> DNA
<213> Eucalyptus grandis

<400> 690
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cgtgggtctt gcgttgttgg tgggtctggt cgcgggtgcg aggtttgagg agctctacca 180
gccgggctgg gctatggacc attttgtcta cgaaggagag gttctcaagc tcaagcttga 240

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caactactct ggcgctgggt tcgggtcgaa gagcaagtac atgttcggca aagttaccat     300
ccagatcaag ctcgtcgagg gcgactcggc tgggaccgtc actgctttct acatgtcgtc     360
ggatggaccg aaccacaacg aattcgactt cgagttcctg ggcaacacga caggggagcc     420
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<210> 691
<211> 346
<212> DNA
<213> Eucalyptus grandis

<400> 691

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ttcctgtagt atgccgtgaa gggcgctttc gaccagtctg tcttgatcag tccgcctctc     180
gtggcccaat catcggcatt ccagaggctc gagtatattt tcatgggctg gttcttgggg     240
aagggcacgc caattgactc tccattcttg aaaactctaa taggaatgtt gtctaccaag     300
aagatgatgt gctggggctt ccagatgacg gagtatgtgt ggaaat                    346
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<210> 692
<211> 470
<212> DNA
<213> Eucalyptus grandis

<400> 692

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gtggcccaat catcggcatt ccagaggctc gagtatatct tcatgggctg gctcttgggg     180
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aagatgatgt gctggggctt ccagatgacg gagtatgtgt ggaaatttct ggtggggtca     300
aaccacaggt agaactgctg ctccctgttg cccttccctt gagtgaagac gttggtgtgg     360
aggatgtaag ggtcgccgct caggttcccc aggaactcga agtcaatctc gtcgtgagtt     420
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<210> 693
<211> 374
<212> DNA
<213> Eucalyptus grandis

<400> 693

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gagctgtaga cgcccatggg ctggtccttc gggtacggga tgccccggtg ctccaagttg     180
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<210> 694
<211> 409
<212> DNA
<213> Eucalyptus grandis

<400> 694

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cggcctgttc gtgggtcttg cgttgttggt gggtctggtc gcgggtgcga ggtttgagga     180
gctctaccag ccgggctggg ctatggacca ttttgtctac gaaggagagg ttctcaagct     240
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caagcttgac aactactctg gcgctgggtt cgggtcgaag agcaagtaca tgttcggcaa 300
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<210> 695
<211> 224
<212> DNA
<213> Eucalyptus grandis

<400> 695
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<210> 696
<211> 442
<212> DNA
<213> Eucalyptus grandis

<400> 696
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acttccactc ctactccgtc ctctggaacc agcgccaagt cgtgtttctt gtggacgaga 420
caccgatccc gcgtgcacac ca 442

<210> 697
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<212> DNA
<213> Eucalyptus grandis

<400> 697
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<210> 698
<211> 469
<212> DNA
<213> Eucalyptus grandis

<400> 698
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<210> 699
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<212> DNA
<213> Eucalyptus grandis

<400> 699
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<210> 700
<211> 452
<212> DNA
<213> Eucalyptus grandis

<400> 700
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<210> 701
<211> 323
<212> DNA
<213> Eucalyptus grandis

<400> 701
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<210> 702
<211> 441
<212> DNA
<213> Eucalyptus grandis

<400> 702
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<210> 703
<211> 345
<212> DNA
<213> Eucalyptus grandis

<400> 703
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<210> 704
<211> 339
<212> DNA
<213> Eucalyptus grandis

<400> 704
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<210> 705
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<212> DNA
<213> Eucalyptus grandis

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<210> 706
<211> 484
<212> DNA
<213> Eucalyptus grandis

<400> 706
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cgcc 484

<210> 707
<211> 317
<212> DNA
<213> Eucalyptus grandis

<400> 707
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gagcttgatc tggatgg 317

<210> 708
<211> 367
<212> DNA
<213> Eucalyptus grandis

<400> 708
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aaccacaggt agaactgctg ctccctgttg cccttccctt gagtgaagac gttggtgtgg 360
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<210> 709
<211> 384
<212> DNA
<213> Eucalyptus grandis

<400> 709
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cccaggaact cgaagtcgaa ttcg 384

<210> 710
<211> 364
<212> DNA
<213> Eucalyptus grandis

<400> 710
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ttgcccaccc cgttcacgta cacgttggtc tgtaccaggt agggctcccc tgtcgtgttg 360
ccca 364

<210> 711

<211> 338
<212> DNA
<213> Eucalyptus grandis

<400> 711
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ttgcccaccc cgttcacgta cacgttggtc tgtaccag 338

<210> 712
<211> 216
<212> DNA
<213> Eucalyptus grandis

<400> 712
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gggcacgcca attnnctctc cattcttgaa aactctaata ggaatgttgt ctaccaagaa 120
gatgatgtgc tggggcttcc agatgacgga gtatgtgtgg aaatttctgg tggggtcaaa 180
ccacaggtag aactgctgct ccctgttgcc cttccc 216

<210> 713
<211> 341
<212> DNA
<213> Eucalyptus grandis

<400> 713
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gagctgtaga cgcccatggg ctggtccttc gggtacggga tgccccggtg ctccaagttg 180
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<210> 714
<211> 413
<212> DNA
<213> Eucalyptus grandis

<400> 714
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tgggtccagt cggtcttgat gcggccgccc tgggtggccc agtcgtcggc gttccatatc 120
gagctgtaga cgcccatggg ctggtccttc gggtacggga tgccccggtg ctccaagttg 180
gtgtgcacgc ggatcggtgt ctcgtccaca agaaacacga cttggcgctg gttccagagg 240
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ttgcccaccc cgttcacgta cacgttggtc tgtaccaggt agggctcccc tgtcgtgttg 360
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<210> 715
<211> 280
<212> DNA
<213> Eucalyptus grandis

<400> 715
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tgtctacnaa ggagaggttc tcaagctcaa gcttgacaac tactctggcg ctgggttcgg 120
gtcgaagagc aagtacatgt tcggcaaaga taccatccag atcaagctcg tcgagggcga 180
ctcggctggg accgncactg ctttctacat gtcgtcggat ggaccgaacc acaacgaatt 240
cgacttcgag ttcctgggca acacgacagg ggagccctac 280

<210> 716
<211> 397
<212> DNA
<213> Eucalyptus grandis

<400> 716
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aggcatcgag ctcattgatt ttccatgtgg atccagagta ggaagcgggc cgtccgatct 120
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ccgtgaaggg cgctttcgac cagtctgtct tgatcagtcc gcctctcgtg gcccaatcat 240
cggcattcca gaggctcgag tatattttca tgggctggtt cttggggaag ggcacgccaa 300
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ggggcttcca gatgacggag tatgtgtgga aatttct 397

<210> 717
<211> 365
<212> DNA
<213> Eucalyptus grandis

<400> 717
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aagatgatgt gctggggctt ccagatgacg gagtatgtgt ggaaatttct ggtggggtca 300
aaccacaggt agaactgctg ctccctgttg cccttccctt gagtgaagac gttggtgtgg 360
aggat 365

<210> 718
<211> 301
<212> DNA
<213> Eucalyptus grandis

<400> 718
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ggccgtccga tctcacagga ggacgagccc gtggaccagg tgcaggcagt ggcctggaac 120
ttcctgtagt atgccgtgaa gggcgctttc gaccagtctg tcttgatcag tccgcctctc 180
gtggcccaat catcggcatt ccagaggctc gagtatattt tcatgggctg gttcttgggg 240
aagggcacgc caattgactc tccattcttg aaaactctaa taggaatgtt gtctaccaag 300
a 301

<210> 719
<211> 383
<212> DNA
<213> Eucalyptus grandis

<400> 719
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ggccgtccga tctcacagga ggacgagccc gtggaccagg tgcaggcagt ggcctggaac 120
ttcctgtagt atgccgtgaa gggcgctttc gaccagtctg tcttgatcag tccgcctctc 180
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aagatgatgt gctggggctt ccagatgacg gagtatgtgt ggaaatttct ggtggggtca 360
aaccacaggt agaactgctg ctc 383

<210> 720
<211> 370
<212> DNA
<213> Eucalyptus grandis

<400> 720
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catgcagctc aagctcgtcg ccgggaactc cgccggcacc gtgaccgctt actacttgtc 120
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gcacatcatc ttcttggtag acaacattcc tattagagtt ttcaagaatg gagagtcaat 360
tggcgtgccc 370

<210> 721
<211> 413
<212> DNA
<213> Eucalyptus grandis

<400> 721
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gaagccgctg aaggaggcgg tgaaaggcgc ctgcgaccag tcagtcttca cgaggccgcc 120
ccgggtggcc cagtcctcag cgtcccatag ggtcgagtag agggtcatgg gctggctctt 180
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aaatcggtgt tattttagaa ggaaatttat ttgttcaaag gttttcatga tcaggacgag 360
gagtacttac acgacgtgta aagggttcca aaggacggag taagtgtgga aat 413

<210> 722
<211> 393
<212> DNA
<213> Eucalyptus grandis

<400> 722
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gctgaggact gggccacccg gggcggcctc gtgaagactg actggtcgca ggcgcctttc 360
accgcctcct tcagcggctt caacgcgagc gct 393

<210> 723
<211> 244
<212> DNA
<213> Eucalyptus grandis

<400> 723
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ccgtcctttg gaacccttta cacgtcgtgt actttgtcga tgggattcca ataagggagt 120
tcaagaactt ggatgcggcg ggggtcccct acccaaagag ccagcccatg accctctact 180
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cgca 244

<210> 724
<211> 238
<212> DNA
<213> Eucalyptus grandis

<400> 724
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gaccagccca tgggcgtcta cagctcgata tggaacgccg acgactgggc cacccagggc 120
ggccgcatca agaccgactg gacccacgcc cccttcatca cgtcctaccg taacttcgag 180
atcgacgcgt gcgagtgccc ggcgaccatg gcggcggcag acaacgccaa gcggtgca 238

<210> 725
<211> 453
<212> DNA
<213> Eucalyptus grandis

<400> 725
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atggccgtgc gcagataccc agcagtggcc agctcctcac gctgtccctg gacaagacgt 120
cggggtcggg cttccggtcc aagaagcagt acttgttcgg gaagattgac atgcagctca 180
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<210> 726
<211> 334
<212> DNA
<213> Eucalyptus grandis

<400> 726
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gatgaaattg tactccagcc tgtggaatgc ggatgactgg gccactcggg gagggcttga 120
gaagaccgac tggtccaagg cgccgttcgt ggcctcttac cgggggttcc acatcgacgg 180
gtgcgaagcg tcggttgagg ccaagttctg cgctactcag ggccagaggt ggtgggacca 240
gaaggagttc caggacctcg atgccttcca gtaccggagg ctccggtggg tgcgctcgaa 300
atacaccatc tacaactact gcgctgtcgg aaga 334

<210> 727
<211> 416
<212> DNA
<213> Eucalyptus grandis

<400> 727
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ttcttgggga acttgagcgg cgatccatac attctccaca ccaacgtctt cagccaaggc 120
aagggtaacc gagagcagca attctatctc tggttcgacc caactgctga tttccacacc 180
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<210> 728
<211> 375
<212> DNA
<213> Eucalyptus grandis

<400> 728
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tctcatggtc gtttcttggg cgacttctgc ttccgcccgc aacttctatc aagacttcga 120
cataacctgg ggagatggcc gaggtcagat cctcaacaat ggcgacctcc tcactctctc 180
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cgatccgtac attct 375

<210> 729
<211> 538
<212> DNA
<213> Eucalyptus grandis

<400> 729
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ccggcaccgt gaccgcttac tacttgtctt cgcaagggcc aactcacgat gagattgact 120
tcgagttcct ggggaacctg agcggcgacc cttacatcct ccacaccaac gtcttcactc 180
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cctggtccac gggctcgtcc tcctgtgaga tcggacggcc cgcttcctac tctggatc 538

<210> 730
<211> 412
<212> DNA
<213> Eucalyptus grandis

<400> 730
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gaatgccgat gattgggcca cgagaggcgg ctgatcaaga cagactggtc ga 412

<210> 731
<211> 350
<212> DNA
<213> Eucalyptus grandis

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<210> 732
<211> 354
<212> DNA
<213> Eucalyptus grandis

<400> 732
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<210> 733
<211> 480
<212> DNA
<213> Eucalyptus grandis

<400> 733
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<210> 734
<211> 343
<212> DNA
<213> Eucalyptus grandis

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cccgacagct gatttccaca cttactccgt cctttggaac cct 343

<210> 735
<211> 359
<212> DNA
<213> Eucalyptus grandis

<400> 735
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gccgatccgg gtgttcaaga acagcaagga ccttggggtg aaattcccct tcaaccagc 359

<210> 736
<211> 360
<212> DNA
<213> Eucalyptus grandis

<400> 736
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<210> 737
<211> 437
<212> DNA
<213> Eucalyptus grandis

<400> 737
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accacgtgtc cgtgacg 437

<210> 738
<211> 341
<212> DNA
<213> Eucalyptus grandis

<400> 738
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ccccagcaca tcatcttctt ggtagacaac attcctatta gagttttcaa gaatggagag 180
tcaattggcg tgcccttccc caagaaccag cccatgaaaa tatactcgag cctctggaat 240
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acggcatact acaggaagtt ccaggccact gcctgcacct g 341

<210> 739
<211> 497
<212> DNA
<213> Eucalyptus grandis

<400> 739
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cctgacgtgg ggtggcagcg accgcgccaa gatcttcagc gggggtcagc tcctgtcgct 120
gtccctcgac agagtgtcgg ggtcgggctt ccggtccaag aaggagtacc tgttcggccg 180
gatcgacatg cagctcaagc tcgttgccgg gaactccgcc ggcaccgtga ccgcttacta 240
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cggcgaccct tacatcctcc acaccaacgt cttcactcaa gggaagggca acagggagca 360
gcagttctac ctgtggtttg accccaccag gaatttccac acatactccg tcatctggaa 420
gccccagcac atcatcttct tggtagacaa cattcctatt agagttttca agaatggaga 480
gtcaattggc gtgccct 497

<210> 740
<211> 497
<212> DNA
<213> Eucalyptus grandis

<400> 740
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ccgccggcac cgtgaccgct tactacttgt cttcgcaagg gccaactcac gatgagattg 120
acttcgagtt cctggggaac ctgagcggcg acccttacat cctccacacc aacgtcttca 180
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tgaaaatata ctcgagcctc tggaatgccg atgattgggc cacgagaggc ggactgatca 420
agacagactg gtcgaaatcg ccttacggat actacagaag ttcaggccac tgctgacctg 480
gccacgggct gtctctg 497

<210> 741
<211> 395
<212> DNA
<213> Eucalyptus grandis

<400> 741
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gaacgagtac ttgttcggca agattgacat gcagctcaag ctcgttcctg gcaactccgc 180
aggcactgtc accgcatact atttatcttc aaatgggtca acgtgggacg agattgactt 240
cgagttcttg ggaacttga gcggcgatcc ctacattctt cacaccaacg tgttcagcca 300
aggcaagggc aaccgagagc agcaattcta tctctggttc gacccaactg ctgatttcca 360
cacctactcc atcctctgga atccacaacg catta 395

<210> 742
<211> 396
<212> DNA
<213> Eucalyptus grandis

<400> 742
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ccgggtggcc cagtcctcag cgtcccatag ggtcgagtag agggtcatgg gctggctctt 180
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aaagtacctg tttttttag cagaaagaga tccgtcattc attatgtggc gaaggacctc 300
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agtacttaca cgacgtgtaa agggttccaa aggacg 396

<210> 743
<211> 347
<212> DNA
<213> Eucalyptus grandis

<400> 743
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caatagggag cagcaattct atctctggtt cgacccgaca gctgatttcc acacttactc 180
cgtcctttgg aaccctttac acgtcgtgta ctttgtcgat gggattccaa taagggagtt 240
caagaacttg gatgcggcgg gggtccccta cccaaagagc cagcccatga ccctctactc 300
gaccctatgg gacgctgagg actgggccac ccggggcggc ctcgtga 347

<210> 744
<211> 446
<212> DNA
<213> Eucalyptus grandis

<400> 744
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cccggcaact ccgcgggcac tgtcaccacc ttatacttac attcggacgg gtcgacctgg 180
gatgagatag acttggagtt cttggggaac ttgagcggcg acccttatat cctccacacc 240
aacttgtaca gccaaggcaa aggcaatagg gagcagcaat tctatctctg gttcgacccg 300
acagctgatt tccacactta ctccgtcctt tggaaccctt tacacgtcgt gtactttgtc 360
gatgggattc caataaggga gttcaagaac ttggatgcgg cgggggtccc ctacccaaag 420
agccagccca tgaccctcta ctcgac 446

<210> 745
<211> 439
<212> DNA
<213> Eucalyptus grandis

<400> 745
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atagagcaat catggcccat gaaggtggag gtcctagtgc ttcctccatg gtggtgctcg 120
tgagcttgct gctgatggct gccgcttcgc ccgcagctgg gaacttctac caggacttcg 180
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ggatcgacat gcagctcaag ctcgtcgccg ggaactccgc cggcaccgtg accgcttact 360
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gcggngaccc ttacatcct 439

<210> 746
<211> 322
<212> DNA
<213> Eucalyptus grandis

<400> 746
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ccaccaggaa tttccacaca tactccgtca tctggaagcc ccagcacatc atcttcttgg 180
tagacaacat tcctattaga gttttcaaga atggagagtc aattggcgtg cccttcccca 240
agaaccagcc catgaaaata tactcgagcc tctggaatgc cgatgattgg gccacgagag 300
gcggactgat caagacagac tg 322

<210> 747
<211> 433
<212> DNA
<213> Eucalyptus grandis

<400> 747
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attcggacgg gtcgacctgg gacgagatag acttggagtt cttggggaac ttgagcggcg 180
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tacacgtcgt gtactttgtc gatgggattc caataaggga gttcaagaac ttggatgcgg 360
cgggggtccc ctacccaaag agccagccca tgaccctcta ctcgacccta tgggacgctg 420
aggactgggc cac 433

<210> 748
<211> 525
<212> DNA
<213> Eucalyptus grandis

<400> 748

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tactctggcg ctgggttcgg gtcgaagagc aagtacatgt tcggcaaagt taccatccag     300
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ggaccgaacc acaacgaatt cgacttcgag ttcctgggca acacgacagg ggagccctac     420
ctggtacaga ccaacgtgta cgtgaacggg gtgggcaacc gggagcagag gctcggcctc     480
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<210> 749
<211> 385
<212> DNA
<213> Eucalyptus grandis

<400> 749

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gctgtccctc gacagagtgt cggggtcggg cttccggtcc aagaaggagt acctgttcgg     180
ccggatcgac atgcagctca agctcgtcgc cgggaactcc gccggcaccg tgaccgctta     240
ctacttgtct tcgcaagggc caactcacga cgagatcgac ttcgagttcc tggggaacct     300
gagcggcgac ccttacatcc tccacaccaa cgtcttcact caagggaagg gcaacaggga     360
gcagcagttc tacctgtggg ttgac                                           385
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<210> 750
<211> 519
<212> DNA
<213> Eucalyptus grandis

<400> 750

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tatcatctca ttggcatttg catctcttca gcaactacag ccgcagcagc agcagcaaaa     120
aacaaaacac gccccatatg gcctctcgtt ccacttcttc gctttgtacc accgcgcttc     180
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ttgacatgca actcaagctc gttcccggca actccgcagg caccgtcacc gcttactatt     420
tatcttcaaa cggtcgacg tgggacgaga tagacttcga gttcttgggg aacttgagcg      480
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<210> 751
<211> 342
<212> DNA
<213> Eucalyptus grandis

<400> 751

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gctgtccctc gacagagtgt cggggtcggg cttccggtcc aagaaggagt acctgttcgg     180
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ctacttgtct tcgcaagggc caactcacga cgagatcgac ttcgagttcc tggggaacct     300
gagcggcgac ccttacatcc tccacaccaa cgtcttcact ca                        342
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<210> 752
<211> 416
<212> DNA
<213> Eucalyptus grandis

<400> 752
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gttcgtgggt cttgcgttgt tggtgggtct ggtcgcgggt gcgaggtttg aggagctcta 180
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catccagatc aagctcgtcg agggcgactc ggctgggacc gtcactgctt tctacatgtc 360
gtcngatgga ccgaaccaca acgaattcga cttcgagttc ctgggcaaca cgaaca 416

<210> 753
<211> 408
<212> DNA
<213> Eucalyptus grandis

<400> 753
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caagctcgtc gagggcgact cggctgggac cgtcactgct ttctacatgt cgtcggatgg 360
accgaaccac aacgaattcg acttcgagtt cctgggcaac acgaacag 408

<210> 754
<211> 401
<212> DNA
<213> Eucalyptus grandis

<400> 754
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atccagatca agctcgtcga gggcgactcg gctgggaccg tcactgcttt ctacatgtcg 360
tcggatggac cgaaccacaa cgaattcgac ttcgagttct g 401

<210> 755
<211> 403
<212> DNA
<213> Eucalyptus grandis

<400> 755
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cttgcgttgt tggtgggtct ggtcgcgggt caaggtttga ggagctctac cagccgggct 180
gggctatgga ccattttgtc tacgaaggag aggttctcaa gctcaagctt gacaactact 240
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agctcgtcga gggcgactcg gctgggaccg tcactgcttt ctacatgtcg tcggatggac 360
cgaaccacaa cgaattcgac ttcgagttcc tgggcacacg aca 403

<210> 756
<211> 414
<212> DNA
<213> Eucalyptus grandis

<400> 756
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catccagatc aagctcgtcg agggcgactc ggctgggacc gtcactgctt tctacatgtc 360
gtcggatgga ccgaaccaca acgaattcga cttcgagttc ctggcaacac gaca 414

<210> 757
<211> 441
<212> DNA
<213> Eucalyptus grandis

<400> 757
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catgacttgc tcgtggtgtc t 441

<210> 758
<211> 499
<212> DNA
<213> Eucalyptus grandis

<400> 758
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<210> 759
<211> 340
<212> DNA
<213> Eucalyptus grandis

<400> 759
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attgagcacc aattaagctg caacgatgtc ccaagtcata 340

<210> 760
<211> 350
<212> DNA
<213> Eucalyptus grandis

<400> 760
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<210> 761
<211> 288
<212> DNA
<213> Eucalyptus grandis

<400> 761
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<210> 762
<211> 364
<212> DNA
<213> Eucalyptus grandis

<400> 762
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atttccacac atactccgtc atctggaagc cccagcacat catcttcttg gtagacaaca 180
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ccatgaaaat atactcgagc ctctggaatg ccgatgattg ggccacgaga ggcggactga 300
tcaagacaga ctggtcgaaa tcgcccttca cggcatacta caggaagttc caggccactg 360
cctg 364

<210> 763
<211> 343
<212> DNA
<213> Eucalyptus grandis

<400> 763
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ccttcatcac gtcctaccgt aacttcgaga tcgacgcgtg cga 343

<210> 764
<211> 301
<212> DNA
<213> Eucalyptus grandis

<400> 764
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gggcaaccgg gagcagaggc tcggcctctg gttcgacccc accactgact tccactccta 180

ctccgtcctc tggaaccagc gccaagtcgt gtttcttgtg gacgagacac cgatccgcgt 240
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c 301

<210> 765
<211> 516
<212> DNA
<213> Eucalyptus grandis

<400> 765
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aaccacaacg aattcgactt cgagttcctg ggcaacacga caggggagcc ctacctggta 420
cagaccaacg tgtacgtgaa cggggtgggc aaccgggagc agagctcggc ctctggttcg 480
accccaccac tgacttcact cctactccgt cctctg 516

<210> 766
<211> 349
<212> DNA
<213> Eucalyptus grandis

<400> 766
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gccccagcac atcatcttct tggtagacaa cattcctatt agagttttc 349

<210> 767
<211> 479
<212> DNA
<213> Eucalyptus grandis

<400> 767
gcgggttcca aacgaagcag agataccgat tcgggtggtt cagcatgaag ctcaagctcg 60
tgggaggcga ctcggccgga gtggtcactg cttactacat gtgttcggag aacggggcag 120
ggccggagag ggatgagctg gacttcgagt tcttggggaa ccggagcgga cagccgtatc 180
tgatccagac caacgtgtac aagaacggga cgggctcgcg cgagatgcgg cacatgctct 240
ggttcgaccc gaccgaggac ttccactcct attccatcct ctggaacagc caccagattg 300
tgttcttcgt cgaccaggtg ccggtcaggg tgttcaagaa caacggcgag gcgaacaact 360
tcttccccaa cgagaagccc atgtacctct tctcgagcat ctggaacgcc gacgactggg 420
ccacgagggg cggccttgag aagaccgact ggaccaaggc gccgttcgtg tccacctac 479

<210> 768
<211> 371
<212> DNA
<213> Eucalyptus grandis

<400> 768
gttcggcctg atcgaagtca atctcaccgt gaccgcttac tacttgtctt cgcaagggcc 60
aactcacgat gagattgact tcgagttcct ggggaacctg agcggcgacc cttacatcct 120
ccacaccaac gtcttcactc aagggaaggg caacagggag cagcagttct acctgtggtt 180

tgaccccacc agaaatttcc acacatactc cgtcatctgg aagccccagc acatcatctt 240
cttggtaaca acatcaccca tctctctctc tctctccccc actctctctc aagccaaaat 300
ataagccaaa gtataagcca aagtatagag caatcatggc ccatgaaggt ggaggtccta 360
gtgcttcctc c 371

<210> 769
<211> 368
<212> DNA
<213> Eucalyptus grandis

<400> 769
gttcggccgg atcgaagtca atctcaccgt gaccgcttac tacttgtctt cgcaagggcc 60
aactcacgat gagattgact tcgagttcct ggggaacctg agcggcgacc cttacatcct 120
ccacaccaac gtcttcactc aagggaaggg caacagggag cagcagttct acctgtggtt 180
tgaccccacc agaaatttcc acacatactc cgtcatctgg aagccccagc acatcatctt 240
cttggtagac aacatcaccc atctctctct ctctctcccc cactctctct caagccaaaa 300
tataagccaa agtataagcc aaagtataga gcaatcatgg cccatgaagg tggaggtcct 360
agtgcttc 368

<210> 770
<211> 342
<212> DNA
<213> Eucalyptus grandis

<400> 770
ccagtccaag aacgagtacc tgtttggcaa gattgacatg caactcaagc tcgttcccgg 60
caactccgca ggcaccgtca ccgcttacta tttatcttca aacgggtcga cgtgggacga 120
gatagacttc gagttcttgg ggaacttgag cggcgatcca tacattctcc acaccaacgt 180
cttcagccaa ggcaagggta accgagagca gcaattctat ctctggttcg acccaactgc 240
tgatttccac acctactcca tcctctggaa tccacaacgc atcatattct catggacggg 300
actcccatca gagagttcaa gaacgcagag tccatcggcg tt 342

<210> 771
<211> 580
<212> DNA
<213> Eucalyptus grandis

<400> 771
ctcctcttca gtcctcactc tcatatcatc tcattgagat ttgcttctct tcagcaacta 60
cagcagcagc agcagcagac agaacacgcc caatatggcc tccctttcta cttcttcgct 120
tcgcatcgcc actctgcttc tcgtggtcgt ttcttggggg acgtttgctt ccgcccgcaa 180
cttctatcaa gacttcgaca taacctgggg tgatggccga gctcagatcc tcaacaacgg 240
cgacctcctc actctctccc tcgacaaggc ctccggctcc ggcttccagt ccaagaacga 300
gtacttgttc ggcaagattg acatgcagct caagctagtt cccggcaact ccgctggcac 360
cgtcaccgca tactatttat cttcaaacgg gtcggcgtgg gatgagatag acttcgagtt 420
cttggggaac ttgagcggcg atccatacat tctccacacc aacgtcttca gccaaggcaa 480
gggtaaccga gagcagcaat tctatctctg gttcgaccca actgctgatt tccacaccta 540
ctccatcctc tggaatccac aacgcatcat attctcagtg 580

<210> 772
<211> 407
<212> DNA
<213> Pinus radiata

<400> 772
agtagtgtgc ccttcacaac aattatgtcg ccagctgggg ctcagatcac atcaaacatt 60
ccatggcggt cgaaagatga gctgctcctc aacaaacagt atggtgcggg gtttgagtcg 120

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aaggggacat atttatttgg gcatttcagt atgcagataa agctggttgc cggtgattcc     180
gctggcactg tcaccgcctt ttatctttct tctcagactg cagagcacga tgagatagac     240
tttgaattct tggggaacaa gtcgggggaa ccctacattc ttcagaccaa tgtatttacg     300
ggcgggaagg gtgagagaga gcaccgaata tacctctggt tcgaccccac caaggattac     360
cattcctatg cggtgctctg gaacatgtcc caaattgcat tttggt                    407
```

<210> 773
<211> 403
<212> DNA
<213> Pinus radiata

<400> 773

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tgacaatgga caagagttgc agcttactct tgaccgctct tcaggttgtg gtattcaatc      60
caagcaagag tatctatttg ccaagattga tatccaaatc aagttggtac ctggcaactc     120
tgcaggcaca gtcactacct tttatctatc atctcaaggt cccaaacacg acgaaataga     180
cttcgaattt ctgggcaacc tgtccggaga tccttatatt ttgcacacta atgtctttgc     240
tcaaggcctt ggtgggcgtn agcagcaatt ttacttgtgg ttcgacccaa ccctggattt     300
ccacacttac tccgtgctct ggacatcaaa ccaaattata ttttctgtag acgggagtct     360
attcgagtgt ttaagaacag ggagacagag tngggtaaag tgg                       403
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<210> 774
<211> 400
<212> DNA
<213> Pinus radiata

<400> 774

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tgacaatgga caagagttgc agcttactct tgaccgctct tcaggttgtg gtattcaatc      60
caagcaagag tatctatttg ccaagattga tatccaaatc aagttggtac ctggcaactc     120
tgcaggcaca gtcactacct tttatctatc atctcaaggt cccaaacacg acgaaataga     180
cttcgaattt ctgggcaacc tgtccggaga tccttatatt ttgcacacta atgtctttgc     240
tcaaggcctt ggtgggcgtg agcagcaatt ttacttgtgg ttcgacccaa ccctggattt     300
ccacacttac tccgtgctct ggacatcaaa ccaaattata tttctgtaga cgggagtcta     360
ttcgagtgtt taagaacagg gagacagagt tgggtaaagt                           400
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<210> 775
<211> 384
<212> DNA
<213> Pinus radiata

<400> 775

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gataactgtt gttgataata atggcttgtt taagaatgca gagttgctgc ttcttcattc      60
tggttttttg cttctgggta tctaattgtg cagagttcaa tgatatcttc gagcccagct     120
gggcgattga tcatgttatg aacgagggag agctgttgaa gctgaagctc gacaactttt     180
ctggcgctgg cttttcttcc aaggcaacat acttgtttgg aaaagtaggg gcgcagatta     240
aactcgttcc cggcgactct gcgggcacgt gactgcattt tatatgtctt ctgaggggac     300
attgcatgac gaattcgatt tcgaattctt gggaaatgct tcgggtgagc cttacattgt     360
gcagactaat atctactcaa tggg                                            384
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<210> 776
<211> 345
<212> DNA
<213> Pinus radiata

<400> 776

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tgagaaacag cccatgaggg ggtcctcttc aatctggatg cagataactg ggctactcaa      60
ggtgggcggc tgaagataaa ctggggccat tctcctttta tctccactta caaaggcttc     120
aacattggtg caaacaaata cggattaaat ggagaaccaa gaggggttat taaaaatgga     180
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agtaagtggt gggacaggcc ctctcattct tcccttactc cattacaaag gcgaatgctc 240
cgatgggtac atcggaacta tatcatctat gattactgca aggattcgac caggttttcc 300
acttcgccac ctgagtgtgc aggcctccgc ttctagttct ttata 345

<210> 777
<211> 449
<212> DNA
<213> Pinus radiata

<400> 777
gttgggtagc aacgtatgca gataagctgt tgttaaaatg gcttctttga gtatgcagag 60
ctgcttctta attctggctc tttgcttctg ggcatcccat tgtgcacagt ttaatgatat 120
cttcgagccc agctgggcga cagatcatgt tatgtatgag ggagagctgt tgaagcttaa 180
gctggacaat atttccgggg ctggctttgc ttccaagaca acatatttgt ttggaaaagc 240
aggggcacag attaagctcg ttccaggtga ctctgcaggc acagttactg ctttttatat 300
gtcttctgag ggactctgc acgacgaatt cgatttcgaa ttcttgggaa atgcttcggg 360
tgagccttac attgtgcaga cgaatatcta ctccaacggc actggcaaaa gggaacaacg 420
tattacctct ggttcgaccc cacggcaga 449

<210> 778
<211> 354
<212> DNA
<213> Pinus radiata

<400> 778
tattaatcca taattatgga catgggcatg cccctcctct ttcttttctt attaataacc 60
tcgtcgagtc ttcttgtaac tgtttctgca aatttctaca acgatgtaga tatcacatgg 120
ggcaatggtc gtggtaaaat ccttgacaat ggccaacaat tacagcttac tctggatcgc 180
acttcaggtt gtgggtttca atctaagaat gagtatctgt ttgctaaaat tgatatgcaa 240
ataaagttgg tacctggcaa ctctgccggc acagttactg cctattatct gtcgtctcaa 300
ggttccgaac acgacgaaat agactatgaa tttctaggca acctgtctgg agat 354

<210> 779
<211> 392
<212> DNA
<213> Pinus radiata

<400> 779
ccggtctgtt gttgtgggaa ataggatggc cgggaaaagg aattggttca agagaatcga 60
gtttattgtt atattcgtgg tttgcttaaa ctctgtttct gcacgcccgg catcatttgc 120
agaggatttt aaagtgacgt gggcagatga ccatgtcaaa acaaggtcag ataacaactc 180
catcgatctc atcctggatc agaattcagg ggcaggattt gcctccaaga atcagtacat 240
gtttggactt gtaagcatga acatcaaact tgtggcgggt gattctgcag ggacagtcac 300
tgctttttat atgagctcgg acaaggagga agtgcgagat gaattggatt tcgagtttct 360
ggggacagat caggacagcc ttatacagtc ca 392

<210> 780
<211> 293
<212> DNA
<213> Pinus radiata

<400> 780
cgtttattca aaagggggttg gcaacagaga acagcgcttt ttcttatggt tcgacccaac 60
tgcagacttt cattcctatt cctttctgtg gaatcgccac caagttgttt tctttgtgga 120
tgatgtgccc gtacggatat tttccaacaa tgagaaaaga ggagtcccat atcctcaaac 180
tcaacccatg ggcgtatact cgtcaatatg gaacgcagac gattgggcta ctcaaggggg 240
cctcgtcaag accgattgga gccacgcacc tttcatttcc acatacaaga att 293

<210> 781
<211> 451
<212> DNA
<213> Pinus radiata

<400> 781
ctccaatggc actggcaaca gggaacaacg catttacctc tggttcgacc ccaccgcaga 60
tttccattcc tattcttttc tgtggaacca caagcaagtt gtattctttg tagacagtgt 120
tccgattagg gtattcccca acaacgagag gctgggagtc ccatatccta agaaacagcc 180
catgagggta tcctcttcaa tctggaatgc agataactgg gctactcaag gtgggcggct 240
gaagataaac tggagccatt ctccttttat ctccacttac agaaggttcg acatcgatgc 300
aaaccaatac ggattaaatg gagaatcaag agggtttatt gagaatggaa gtaagtggtg 360
ggacaggccc tctcattctt cccttactcc attacaaagg cgaatgctcc cgatgggtgc 420
atcggaacta tatcatctat gcctacctga a 451

<210> 782
<211> 387
<212> DNA
<213> Pinus radiata

<400> 782
cactggctta gatacacagt ccagtcgaat cgggtcttga ggatggcatt cgtaggttgt 60
caagaagggg gtcgtgtcat gcactgcgct cttctttgta tctttgtaac gttgtgcaac 120
ctgctcgtga gctctcaatg tgcgtccttc gacgatttct tctaccccag ttgggctgtt 180
gatcatgtca tgtcccaagg agagttgctc cagctcaagc ttgataacat ttctggtgca 240
ggatttgctt cgaagagcac atacatcttc ggaaaagcaa atgtgcagat taagctcgtt 300
cccggggact ctgctggcac tgttactgca ttctatatgt cttcccaagg cgatcagcat 360
gacgaattcg actttgaatt tttgggg 387

<210> 783
<211> 401
<212> DNA
<213> Pinus radiata

<400> 783
cgtttattca aaaggggttg gcaacagaga acagcgcttt ttcttatggt tcgacccaac 60
tgcagacttt cattcctatt cctttctgtg gaatcgccac caagttgttt tctttgtgga 120
tgatgtgccc gtacggatat tttccaacaa tgagaaaaga ggagtcccat atcctcaaac 180
tcaacccatg ggcgtatact cgtcaatatg gaacgcagac gattgggcta ctcaaggggg 240
cctcgtcaag accgattgga gccacgcacc tttcatttcc acatacaaga atttcagcat 300
tgatgcctgt caatattcct cgaaaacgag ctgcgcttcg tggtgggatg agcctgctta 360
cgcttctctt gatggaaagc agaggctgaa actgaatggg t 401

<210> 784
<211> 370
<212> DNA
<213> Pinus radiata

<400> 784
cttcagacca atgtatttac gggcgggaag ggtgagagag agcaccgaat atacctctgg 60
ttcgacccca ccaaggatta ccattcctat gctgtgctct ggaacatgta ccaaattgca 120
tttttggtan atgaggtacc aatccgggtg ttcaagaaca gcaaggatct gggcgtgagg 180
tacccattta accagccgat gaagatctat tcgagcctgt ggaatgctga tgactgggcc 240
acccgagggg gtctggagaa aaccgactgg gccaaggcgc ccttcatcgc ctcctacagg 300
gaattccacg tcgatgcctg tgaggcttct gctccgaaat cggtgtgcgc aacgaagggg 360
gcggcggtgg 370

<210> 785
<211> 241
<212> DNA
<213> Pinus radiata

<400> 785
atctactcca acggcactgg caaaagggaa caacgtattt acctctggtt cgaccccacg 60
gcagatttcc attcctattc ttttctatgg aaccacaacc aagttgtttt ctttgtggat 120
agtgttccga ttcgggtatt ccccaacaac gagcggctgg gagtcccata tccgaaaagc 180
cagccgctga gagtatcctc ctcaatctgg aatgcagccg actgggctac acaaggcggg 240
c 241

<210> 786
<211> 180
<212> DNA
<213> Pinus radiata

<400> 786
catctactcc aacggcactg gcaaaaggga acaacgtatt tacctctggt tcgaccccac 60
ggcagatttc cattcctatt cttttctatg gaaccacaac caagttgttt tctttgtgga 120
tagtgttccg attcgggtat tccccaacaa cgagcggctg ggagtcccat atcccgaaaa 180

<210> 787
<211> 264
<212> DNA
<213> Pinus radiata

<400> 787
ctggactttg agtttctggg gaacagaagt ggagagccct atgctctgca gacgaacatc 60
tatgcaaagg gtgtgggtgg cagggaacag aggcacatcc tctggttcga tccaacaaca 120
cagtttcaca cttactccat cctctggaac tctcatcaga ttgtgttctt cgtagaccaa 180
gttcctgtga gagtccacag gcacactgag gctacgagcg atgcgttccc taaagaacag 240
gggatgtaca tgttttccag catt 264

<210> 788
<211> 298
<212> DNA
<213> Pinus radiata

<400> 788
ttccattttc cgcagaattc aaagcatggg gcatcttctc tactctctgg gaaagccgat 60
taactgggcg acgaggggcg ggctggaaaa gattgactgg agcaaggcgc cattcgttgc 120
ctcctacagg ggatttgaga tcgaatcctg ccagtacccg ggtaaagcga gctgcgtggt 180
taacaccagc aattggtggg aagggttgag ctacagcggc ctcaaaccaa atcaagcgag 240
gttatacaaa tgggtgagga cgaattacat gatttatgat tattgtaagg acacgccc 298

<210> 789
<211> 375
<212> DNA
<213> Pinus radiata

<400> 789
tcgtaccagg agactctgca ggagttgtca ctgcttatta tatgtcttct gacacagaca 60
tgaataggga cgagctagat tttgaatttc tagggaacag aagtggacag ccttatggtc 120
ttcagacgaa catctattca aatggtgtgg gtggaaggga acagaggcat atcctctggt 180
tcgatccaac gacagagttt cacacttact ctatcctctg gaacgctcat cagattgtgt 240

ttttcgtgga ccaagttcca ttgagagtcc acaggcacac taaggctaca cgccatgtgt 300
tccctcgaaa gcaggggatg tacatgttct ccagcatttg gaatggagac aactgggcaa 360
cgagaaggcg gcctt 375

<210> 790
<211> 442
<212> DNA
<213> Pinus radiata

<400> 790
tcgtaccagg agactctgca ggagttgtca ctgcttatta tatgtcttct gacacagaca 60
tgaataggga cgagctagat tttgaatttc tagggaacag aagtggacag ccttatggtc 120
ttcagacgaa catctattca aatggtgtgg gtggaaggga acagaggcat atcctctggt 180
tcgatccaac gacagagttt cacacttact ctatcctctg gaacgctcat cagattgtgt 240
ttttcgtgga ccaagtncca ttgagagtcc acaggcacac taaggctaca cgccatgtgt 300
tccctcgaaa gcaggggatg tacatgtnct ccagcatttg gaatggagac aactgggcaa 360
cgagaggcgg cnttgagaag acccaacctg ggcggctgct ccgttcgtat cttcgtacaa 420
gaaattccat gggctcggtg ca 442

<210> 791
<211> 424
<212> DNA
<213> Pinus radiata

<400> 791
cctattcggg tgttttccaa caatgagaaa agaggagtcc catttcctca aacccgccct 60
tatgggcgta tactcttcaa tatggaacgc agatgactgg gctactcaag gtggccgcgt 120
aaagaccgat tggagccacg ctccttttat ttccacatac acaagtttca acatcgatgc 180
ttgcaaatat agccctggca gttcatgtac ttcgtggtgg gatcagccgg cgtacgcctc 240
acttaccgca aagcagcgca tgcaactcaa gtgggtacac gagaaataca tgatttacga 300
ttactgcaaa gatccagtta gatttggtac acctccagca gagtgtactg catgatgtgg 360
gtctttaaac ttgacttcct acccattcca tgatcttaat tcacaaatat ttgtccactt 420
gaat 424

<210> 792
<211> 219
<212> DNA
<213> Pinus radiata

<400> 792
ggcacatgat gcatttatat gtcttctgag gggacttgca tgacgattcg atttcgaatt 60
cttgggaaat gcttcgggtg agccttacat tgtgcagact aatatctact ccaacggcac 120
tggcgacagg gaacaacgca tttacctctg gttcgacccc accgcagatt tccattccta 180
ttcttttctg tggaaccaca agcaagttgt attctttgt 219

<210> 793
<211> 405
<212> DNA
<213> Pinus radiata

<400> 793
attcggcaga gctctggggt ccncagcacc aaacaatctg gaatgatcag tctggaataa 60
ccatttggct cgacaggaac tcgggaagcg gatttaaatc gctgagaccg tacaagtctg 120
gctacttcag tgcagccatt aagttgcagg ctgggtatac tgcaggagtc aatactgcct 180
tttatttatc gaacaacgag gctcacccgg actaccacga tgaaatagac attgaatttc 240
tgggaaatat cccgggaaga ccttatacct tacagaccaa catttatgta agagctggaa 300
atgcgggacg agggaggatt attacaggaa gggngcagca aatccacctt tggtttgatc 360

ccactaagga ttttcaccgt tacagcattc tctggactcc atttg 405

<210> 794
<211> 348
<212> DNA
<213> Pinus radiata

<400> 794
ggaatgggga gagctgggca accaacggag gaaagacaaa gatcacctgg gagccttacc 60
catttgttgc tcagttcaga aacttttaca tcgatggctg tgagtggaat ggaaacccta 120
ggttctgcaa gggaggcagc acacaaaatt ggtggaataa gagaacatat gcttacttta 180
acgctgggga tagactcaaa ctccattggg taaggaagca ttatctcgtc tatgactact 240
gtaatgacaa ggtcagattc aaagtagccc ctgaggaatg caggtaccac atttaatcca 300
tagcctgccg agcatttttt agtatttggt aataagacag tctggtgg 348

<210> 795
<211> 377
<212> DNA
<213> Pinus radiata

<400> 795
ctttctctgg gaatcgccac caatctgttt tctttgtgga cgatgtacct attcgggtgt 60
tttccaacaa tgagaaaaga ggagtcccat ttcctcaaac ccgccctatg ggcgtatact 120
cttcaatatg gaacgcagat gactgggcta ctcaaggtgg ccgcgtaaag accgattgga 180
gccacgctcc ttttatttcc acatacacaa gtttcaacat cgatgcttgc aaatacagcc 240
ctggtagttc atgtacttcg tggtgggatc agccggcgta cgcctcactt accgcaaagc 300
agatcatgca actcaagtgg gtacacgaga aatacatgat ttacgattac tgcaaagatt 360
cagttagatt tggtaca 377

<210> 796
<211> 379
<212> DNA
<213> Pinus radiata

<400> 796
gacatggctt gtttaagatt gcagagctgc tgctttttcg ttctggtttt ttgcttctgg 60
gtatctaatt gtgcagagtt caatgatatc ttcgagccca gctgggcgat tgatcatgtt 120
atgaacgagg gagagctgtt gaagctgaag ctcgacaatt tttctggcgc tggcttttct 180
tccaaggcca catacttgtt tggaaaagta ggggcgcaga ttaaactcgt tcccggcgac 240
tctgcgggca cagtgactgc attttatatg tcttctgagg ggacattgca tgacgaattc 300
gatttcgaat tcttgggaaa tgcttcgggt gaagccttac attgtgcaga ctaatatcta 360
ctccaaacgg gaactggcg 379

<210> 797
<211> 315
<212> DNA
<213> Pinus radiata

<400> 797
tagacattga atttctggga aatatcccgg gaagacctta taccttacag accaacattt 60
atgtaagagc tggaaatgcg ggacgaggga ggattattac aggaagggag cagcaaatcc 120
acctttggtt tgatcccact aaggattttc accgttacag cattctctgg actccattga 180
agattatatt ttttgtggat gacatcccaa taagaaagta tcgaaggacg aacccttaca 240
ctttccccggc aaggcccatg tgggctgtac ggatcgattc tgggatgcat ctccttgggc 300
tacagataac gggaa 315

<210> 798

<211> 412
<212> DNA
<213> Pinus radiata

<400> 798
ggaaactttg atgatgattt ttacattatg tggtcacctg atcatgtcac caggctctac 60
aatggacatg gcgtgcagat tagtatggac aggcagtcag gttcgggctt cgcaacgaag 120
aaacaatatt tgtttggcaa gttcgaaatg caaatcaagc ttccaccagg aaattctgcg 180
ggcactgttg tggctgttta tttgtattcc aatcagccaa acagagacga gatcgacatt 240
gaatttttgg gcaatgttga tggcaaggac atcatcatgc agactaatgt ttttgctaat 300
ggctacgatg atcgagagca gcggatcaaa ctctggttgg atcccacagc agattttcac 360
acatacacaa tcttttggaa ccgttaccac attgtatttc tggtagatgg ct 412

<210> 799
<211> 303
<212> DNA
<213> Pinus radiata

<400> 799
ggcagagcta gattttgaat ttctagggaa cagaagtgga cagccttatg gtcttcagac 60
gaacatctat tcaaatggtg tgggtggaag ggaacagagg catatcctct ggttcgatcc 120
aacgacagag tttcacactt actctatcct ctggaacgct catcagattg tgtttttcgt 180
ggaccaagtt ccattgagag tccacaggca cactaaggct acacgccatg tgttccctcg 240
aaagcagggg atgtacatgt tctccagcat ttggaatgga gacaactggg caacgagagg 300
cgg 303

<210> 800
<211> 298
<212> DNA
<213> Pinus radiata

<400> 800
cgtggaccaa gttccattgt gtgtccacag gcacactaag gctacacgcc atgtgttccc 60
tcgaaagcag ggatgtaca tgttctccag catttggaat ggagacaact gggcaacgag 120
aggcggcctt gagaagacca actgggcggc tgctccgttc gtatcttcgt acaagaaatt 180
ccatggcctc ggctgcaaat gggaggatca aaacacgacc caatcgtcct gtgctcacag 240
taataatgca agtgcaaggc actggtggga taagcccgag gcgcggactc tgacgaag 298

<210> 801
<211> 268
<212> DNA
<213> Pinus radiata

<400> 801
tgaagctcaa gcgcgtacca ggagactctg caggagttgt cactgcttat tatatgtctt 60
ctgacacaga catgaatagg gacgagctag attttgaatt tctagggaac agaagtggac 120
agccttatgg tcttcagacg aacatctatt caaatggtgt gggtggaagg gaacagaggc 180
atatcctctg gttcgatcca acgacagagt ttcacactta ctctatcctc tggaacgcnc 240
atcagattgt gtttttcgtg gaccaagt 268

<210> 802
<211> 395
<212> DNA
<213> Pinus radiata

<400> 802
cagagtttca cacttactct atcctctgga acgctcatca gattgtgttt ttcgtggacc 60

aagttccatt gagagtccac aggcacacta aggctacacg ccatgtgttc cctcgaaagc 120
aggggatgta catgttctcc agcatttgga atggagacaa ctgggcaacg agaggcggcc 180
ttgagaagac caactggcg gctgctccgt tcgtatcttc gtacaagaaa ttccatggcc 240
tcggctgcaa atgggaggat caaaacacga cccaatcgtc ctgtgctcac agtaataatg 300
caagtgcaag gcactggtgg gataagcccg aggcgcggac tctgacgaag aaacagaggg 360
aatattacag gtgggtgaac agcaaatatt tgact 395

<210> 803
<211> 429
<212> DNA
<213> Pinus radiata

<400> 803
gttgggtagc agcgtagtgc agataagctg ttgttaaaat ggcttctttg agtatgcaga 60
actgcttctt aattctggct ctttgcttct gggcatccca ttgtgcacag tttaatgata 120
tcttcgagcc cagctgggcg acagatcatg ttatgtatga gggagagctg ttgaagctta 180
agctggacaa tatttccggg gctggctttg cttacaagac aacatatttg tttggaaaag 240
caggggcaca gattaagctc gttccaggtg actctgcagg cacagttact gctttttata 300
tgtcttctga ggggactctg cacgacgaat tcgatttcga attcttgggg aatgcttcgg 360
gtgagcctta cattgtgcag accgaatatc taactccaac ggcactgggc aaaagggaca 420
acgtattta 429

<210> 804
<211> 432
<212> DNA
<213> Pinus radiata

<400> 804
gttgggtagc agcgttgtgc agataagctg ttgttaaaat ggcttctttg agtatgcaga 60
actgcttctt aattctggct ctttgcttct gggcatccca ttgtgcacag tttaatgata 120
tcttcgagcc cagctgggcg acagatcatg ttatgtatga gggagagctg ttgaagctta 180
agctggacaa tatttccggg gctggctttg cttccaagac aacatatttg tttggaaaag 240
caggggcaca gattaagctc gttccaggtg actctgcagg cacagttact gctttttata 300
tgtcttctga ggggactctg cacgacgaat tcgatttcga attcttggga aatgcttcgg 360
gtgagcctta cattgtgcag acgaatatct actccaacgg cactggcaaa aggggacaac 420
gtatttacct ct 432

<210> 805
<211> 438
<212> DNA
<213> Pinus radiata

<400> 805
cgggggtcct gttcgagtgt ttnaagaaca gggagacaga gttgggtaaa gtgganagca 60
attatcatta tcccaaaacc caagcaatga gggtctactc cagcctttgg aatgcagatg 120
attgggcaac caggggtggg cttgtgaaga ccgactggac taaagctccc tttgttgcat 180
ccctccgcaa tttcaatgct gccgctactt cttcttttga tgccgccgca gaggaggtgg 240
ctttggaatc gaaccaagaa cagaggcaga ggctccagtg ggtacgaaag aactacatga 300
tctacgatta ttgtgcagac accaagagat tcccccaggg accgcctccc gaatgcaaat 360
aaaacctcaa tcctttgaat tcagagaatg aactctgaat tctaccttcc aaggaattct 420
gattcatttc tatttaca 438

<210> 806
<211> 393
<212> DNA
<213> Pinus radiata

<400> 806
accatattgt gttttctgta agatgatatc cccattaggg tttacaagaa caacgaagcg 60
agaggtgttc catttccgaa gaatcaaagc atggggatct tcccaanncn ctgggaagcc 120
gataactggg cgacgagggg cgggctggaa aagattgact ggagcaaggc gccattcgtt 180
gcctcctaca ggggatttga gatcgaatcc tgccagtacc cgggtaaagc gagctgcgtg 240
gttaacacca gcaattggtg ggaagggttg agctacagcg gcctcaaacc agatcaagcg 300
aggttataca aatgggtgag gacgaattac atgatttatg attattgtaa ggacacgccc 360
aggtatccag tgctgcccac ttgagtgcaa cgc 393

<210> 807
<211> 259
<212> DNA
<213> Pinus radiata

<400> 807
cacagtttga atggatatct ttcgagccca gctgggcgac agatcatgtt atgtatgagg 60
gagagctgtt gaagcttaag ctggacaata tttccggggc tggctttgct tccaagacaa 120
catatttgtt tggaaaagca ggggcacaga ttaagctcgt tccaggtgac tctgcaggca 180
cagttactgc tttttatatg tcttctgagg ggactctgca cgacgaattc gatttcgaat 240
tcttgggaaa tgcttcggg 259

<210> 808
<211> 440
<212> DNA
<213> Pinus radiata

<400> 808
gcagtttctt tgtggatgat gtgcccgcac ggatattttc caacaatgag aaaagaggag 60
tcccatatcc tgaaactcaa cccatgggcg tatactcgtc aatatggaac gcagacgatt 120
gggctactca agggggcctc gtcaagaccg attggagcca cgcacctttc atttccacat 180
acaagaattt cagcattgat gcctgtcaat attcctcgaa aacgagctgc gtttcgtggt 240
gggatgagcc tgcttacgct tctcttgatg gaaagcagag gctgaaactg aaatgggtac 300
acgagaaata catgacttac gattactgca aagattctgt cagatttccc acgcgtccag 360
cagagtgtga atgaaatgcc cttcttaaac ttgagctctc atcaagatcc cccttcattt 420
ctttgtattg catgcattcc 440

<210> 809
<211> 263
<212> DNA
<213> Pinus radiata

<400> 809
gaagccatga agaggacaca ttttcttgtt ctgtttcnca ttctgttact ccattctgct 60
gccatggcta ccactcccag gaagccagtg agtgtgccct ttcacaacaa ttatgtcgcc 120
agctggggct cagatcacat caaacaattc catggcggtc gaaagactga gctgctcctc 180
aacaaacagt atggtgcggg gtttgantcg aaggggacat atttatttgg gcatttcagt 240
atgcagataa agctggttgc cgg 263

<210> 810
<211> 423
<212> DNA
<213> Pinus radiata

<400> 810
aaatgacaaa taaactgttg ttaaaatggc ttctttgagt atgcagagct gcttcttaat 60
tctggtctct ttgcttctgg gcatcccatt gtgcacagtt taatgatatc ttcgagccca 120
gctgggcgac agatcatgtt atgtatgagg gagagctgtt gaagcttaag ctggacaata 180

```
tttccggggc tggctttgct tccaagacaa catatttgtt tggaaaagca ggggcacaga     240
ttaagctcgt tccaggtgac tctgcaggca cagttactgc tttttatatg tcttctgagg     300
ggactctgca cgacgaattc gatttcgaat tcttgggaaa tgcttcgggt gagccttaca     360
ttgtgcagac gaatatctac tccaacggca ctggcaaaag ggacaacgta ttaacctctg     420
ggt                                                                   423
```

<210> 811
<211> 483
<212> DNA
<213> Pinus radiata

<400> 811

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gtcaaaagca tttctctttt ggatagctag caggaggctg gtgcttttct aggcaatgct      60
gatcaatatg gtgcccaatg tactgttatt tctcttggta gcggcaatgg ctgctactgc     120
tacccccacct ccgaagcctg tggatgtgcc attccaaaaa aactatgtac ccacctgggc    180
ttctgatcat atcaagtaca ttaatggggg gaacgaagcg cactttctct tgacaaatgg     240
acaggtactg gcttccaatc caagggtagc tacttgtttg gacatttcag tatgcagata     300
aagatggttc ctggtgactc tgcaggcgtt gtgactgcct tttatttatc ctctcagaac     360
tctgaacatg atgaaataga ctttgagttc ttgggcaata ggtctggaca accttacatt     420
ctccaaacta atgttttcag tggaggaagg ggggcaagag agcaacgcga atatccctgg     480
ttt                                                                   483
```

<210> 812
<211> 323
<212> DNA
<213> Pinus radiata

<400> 812

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tgacaatgga caagagttgc agcttactct tgaccgctct tcaggttgtg gtattcaatc      60
caagcaagag tatctatttg ccaaagattg atatccaaat caagttggta cctggcaact     120
ctgcaggcac agtcactacc ttttatctat catctcaagg tcccaaacac gacgaaatag     180
acttcgaatt tctgggcaac ctgtccggag atccttatat tttgcacact aatgtctttg     240
ctcaaggcct tggtgggcgt gagcagcaat tttacttgtg gttcgaccca accctggatt     300
tccacactta ctccgtgctc tgg                                             323
```

<210> 813
<211> 430
<212> DNA
<213> Pinus radiata

<400> 813

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tgacaatgga caagagttgc agcttactct tgaccgctct tcaggttgtg gtattcaatc      60
caagcaagag tatctatttg ccaagattga tatccaaatc aagttggtac ctggcaactc     120
tgcaggcaca gtcactacct tttatctatc atctcaaggt cccaaacacg acgaaataga     180
cttcgaattt ctgggcaacc tgtccggaga tccttatatt ttgcacacta atgtctttgc     240
tcaaggcctt ggtgggcgtg agcagcaatt ttacttgtgg ttcgacccaa ccctggattt     300
ccacacttac tccgtgctct ggacatcaaa ccaaattata ttttctgtag acgggagtcc     360
tattcgagtg ttaagaacag ggagacagag ttgggaaagt ggaaacaatt atcattatcc     420
caagagcaag                                                            430
```

<210> 814
<211> 331
<212> DNA
<213> Pinus radiata

<400> 814

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gtttcgggcg ccagtgaagg tcgttggaag ccatgaagag gacacagttt cttgttctgt      60
```

ttctcattct gttactccat tctgctgcca tggctaccac tcccaggaag ccagtgagtg 120
tgccctttca caacaattat gtcgccagct ggggctcaga tcacatcaaa caattccatg 180
gcggtcgaaa gactgagctg ctcctcaaca aacagtatgg tgcggggttt gagtcgaagg 240
ggacatattt atttgggcat ttcagtatgc agataaagct ggttgccggt gattccgctg 300
gcactgtcac cgccttttat ctttcttctc a 331

<210> 815
<211> 257
<212> DNA
<213> Pinus radiata

<400> 815
gcatttacct ctggttcgac cccaccgtag atttccattc ctattctttt ctgtggaacc 60
acaagcaagt tgtattcttt gtagacagtg ttccgattag ggtattcccc aacaacgaga 120
ggctgggagt cccatatcct aagaaacagc ccatganggn atcctcttca atctggaatg 180
cagataactg ggctactcaa ggtgggcggc tnangataaa ctggagccat tctcctttna 240
tctccactta caaaagg 257

<210> 816
<211> 216
<212> DNA
<213> Pinus radiata

<400> 816
accccaccaa ggattaccat tcctatgctg tgctctggaa catgtaccaa attgcatttt 60
tggtagatga ggtaccaatc cgggtgttca agaacagcaa ggatctgggc gtgaggtacc 120
catttaacca gccgatgaag atctattcga gcctgtggaa tgctgatgac tgggccaccc 180
gagggggtct ggagaaaacc gactgggcca aggcgc 216

<210> 817
<211> 393
<212> DNA
<213> Pinus radiata

<400> 817
gccagctggg gctcagatca catcaaacaa ttccatggcg gtcgaaagac tgagctgctc 60
ctcaagaaac agtatggtgc ggggtttgag tcgaagggga catatttatt tgggcatttc 120
agtatgcaga taaagctggt tgccggtgat tccgctggca ctgtcaccgc cttttatctt 180
tcttctcaga ctgcagagca cgatgagata gactttgaat tcttggggaa caagtcgggg 240
gaaccctaca ttcttcagac caatgtattt acgggcggga agggtgagag agagcaccga 300
atatacctct ggttcgaccc caccaaggat taccattcct atgctgtgct ctggaacatg 360
taccaaattg catttttggt tagatgaggt acc 393

<210> 818
<211> 457
<212> DNA
<213> Pinus radiata

<400> 818
gccagctggg gctcagatca catcaaacaa ttccatggcg gtcgaaagac tgagctgctc 60
ctcaacaaac agtatggtgc ggggtttgag tcgaagggga catatttatt tgggcatttc 120
agtatgcaga taaagctggt tgccggtgat tccgctggca ctgtcaccgc cttttatctt 180
tcttctcaga ctgcagagca cgatgagata gactttgaat tcttggggaa caagtcgggg 240
gaaccctaca ttcttcagac caatgtattt acgggcggga agggtgagag agagcaccga 300
atatacctct ggttcgaccc caccaaggat taccattcct atgctgtgct ctggaacatg 360
taccaaattg catttttggt agatgaggta ccaatccggg tgttcaagaa cagcaaggat 420
ctgggcgtga ggacccattt aaccagccga tgaagat 457

<210> 819
<211> 283
<212> DNA
<213> Pinus radiata

<400> 819
cgantatacc tctggttcga ccccaccaag gattaccatt cctatgctgt gctctggaac 60
atgtaccaaa ttgcattttt ggtagatgag gtaccaatcc gggtgttcaa gacacagcaa 120
ggatctgggc gtgaggtacc catttaacca gccgatgaag atctattcga gcctgtggaa 180
tgctgatgac tgggccaccc gagggggtct ggagaaaacc gactgggcca aggcgccctt 240
catcgcctcc tacagggaat tccacgtcga tgcctgtgag gct 283

<210> 820
<211> 342
<212> DNA
<213> Pinus radiata

<400> 820
cattcctatt ctttttgtg gaaccacaag caagttgtat tctttgtaga cagtgttccg 60
attagggtat tccccaacaa cgagaggctg ggagtcccat atcctaagaa acagcccatg 120
agggtatcct cttcaatctg gaatgcagat aactgggcta ctcaaggtgg gcggctgaag 180
ataaactgga gccattctcc ttttatctcc acttacaaaa ggttcgacat cgatgcaaac 240
caatacggat taaatggaga atcgagaggg gttattgaga atggaagtaa gtggtgggac 300
aggccctctc attcttccct tactccatta caaaggcgat gc 342

<210> 821
<211> 316
<212> DNA
<213> Pinus radiata

<400> 821
cgaatatacc tctggttcga ccccaccaag gattaccatt cctatgctgt gctctggaac 60
atgtaccaaa ttgcattttt ggtagatgag gtaccaatcc gggtgttcaa gaacagcaag 120
gatctgggcg tgaggtaccc atttaaccag ccgatgaaga tctattcgag cctgtggaat 180
gctgatgact gggccacccg agggggtctg gagaaaaccg actgggccaa ggcgcccttc 240
atcgcctcct acagggaatt ccacgtcgat gcctgtgagg cttctgctcc ggaatcggtg 300
tgcgctacgc aggggg 316

<210> 822
<211> 460
<212> DNA
<213> Pinus radiata

<400> 822
tgacaatgga caagagttgc agcttactct tgaccgctct tcaggttgtg gtattcaatc 60
caagcaagag tatctatttg ccaagattga tatccaaatc aagttggtac ctggcaactc 120
tgcaggcaca gtcactacct tttatctatc atctcaaggt cccaaacacg acgaaataga 180
cttcgaattt ctgggcaacc tgtccggaga tccttatatt ttgcacacta atgtctttgc 240
tcaaggcctt ggtgggcgtg agcagcaatt ttacttgtgg ttcgacccaa ccctggattt 300
ccacacttac tccgtgctct ggacatcaaa ccaaattata ttttctgtag acgggagtcc 360
tattcgagtg tttaagaaca gggagacaga gttgggtaaa gtggataaca attatcatta 420
tcccaagagc caagcaatga gcgtctactc cagcctttgg 460

<210> 823
<211> 329
<212> DNA

<213> Pinus radiata

<400> 823
cgtctcaagg ccccaaacat gacgaaatag actttgaatt tcttggcaac ctctctgggg 60
atccttatat tatgcacact aatgtcttcg ctcaaggcct tggcaatcgt gagcaacaat 120
tttacttgtg gttcgaccca accttggatt tccacactta ctccgtgctc tggacatcaa 180
accaaatcat attctctgta gacgagactc ccgttcgagt gtttaagaac agggagacag 240
agttgggtaa agtggatagc aattatcact atcctaagag ccaagcaatg aaggtctatt 300
caagcctctg gaatgcagat gattgggcg 329

<210> 824
<211> 328
<212> DNA
<213> Pinus radiata

<400> 824
ctttctctgg aatcgccacc aatctgtttt ctttgtggac gatgtaccta ttcgggtgtt 60
ttccaacaat gagaaaagag gagtcccatt tcctcaaacc cgccctatgg gcgtatactc 120
ttcaatatgg aacgcagatg actgggctac tcaaggtggc cgcgtaaaga ccgattggag 180
ccacgctcct tttatttcca catacacaag tttcaacatc gatgcttgca aatacagccc 240
tggtagttca tgtacttcgt ggtgggatca gccggcgtac gcctcactta ccgcaaagca 300
gatcatgcaa ctcaagtggg tacacgag 328

<210> 825
<211> 352
<212> DNA
<213> Pinus radiata

<400> 825
gcatttacct ctggttcgac cccaccgcag atttccattc ctattctttt ctgtggaacc 60
acaagcaagt tgtattcttt gtagacagtg ttccgattag ggtattcccc aacaacgaga 120
ggctgggagt cccatatcct aagaaacagc ccatgagggt atcctcttca atctggaatg 180
cagataactg ggctactcaa ggtgggcggc tgaagataaa ctggagccat tctcctttta 240
tctccactta caaaaggttc gacatcgatg caaaccaata cggattaaat ggagaatcaa 300
gagggtttat tgagaatgga agtaagtggt gggacaggcc ctctcattct tc 352

<210> 826
<211> 215
<212> DNA
<213> Pinus radiata

<400> 826
gccagctggg gctcagatca catcaaacaa ttccatggcg gtcgaaagac tgagctgctc 60
ctcaacaaac agtatggtgc ggggtttgag tcgaagggga catatttatt tgggcatttc 120
agtatgcaga taaagctggt tgccggtgat tccgctggca ctgtcaccgc ctttnatctt 180
tcttctcaga ctgcagagca cgatgagatg acttt 215

<210> 827
<211> 463
<212> DNA
<213> Pinus radiata

<400> 827
gttgacatgg cttgtttaag attgcagagc tgctgctttt tcgttctggt ttttttgctt 60
ctgggtatct aattgtgcag agttcaatga tatcttcgag cccagctggg cgattgatca 120
tgttatgaac gagggagagc tgttgaagct gaagcttggc catttttct ggcgctggct 180
tttcttccaa ggccacatac ttgtttggaa aagtaggggc gcagattaaa ctcgttcccg 240

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gcgactctgc gggcacagtg actgcatttt atatgtcttc tgaggggaca ttgcatgacg     300
aattcgattt cgaattcttg ggaaatgctt cgggtgagcc ttacattgtg cagactaata     360
tctactccaa cggcactggc gacagggaac aacgcattta cctctggttc gaccccaccg     420
cagatttcca ttcctattct tttctgtgga accacaagca agt                       463
```

<210> 828
<211> 342
<212> DNA
<213> Pinus radiata

<400> 828

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caacttttct ggcgctggct tttcttccaa ggcaacatac ttgtttggaa aagtaggggc      60
gcagattaaa ctcgttcccg gcgactctgc gggcacagtg actgcatttt atatgtcttc     120
tgaggggaca ttgcatgacg aattcgattt cgaattcttg ggaaatgctt cgggtgagcc     180
ttacattgtg cagactaata tctactccaa tggcactggc aacagggaac aacgcattta     240
cctctggttc gaccccaccg cagatttcca ttcctattct tttctgtgga accacaagca     300
agttgtattc tttgtagaca gtgttccgat tagggtattc cc                        342
```

<210> 829
<211> 447
<212> DNA
<213> Pinus radiata

<400> 829

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ccggtctgtt gttgtgggta ataggatggc cgggcaaagg aattggttca agagaatcga      60
gtttattgtt atattcgtgg tttgcttaaa ctctgtttct gcacgcccgg catcatttgc     120
agaggatttt aaagtgacgt gggcagatga ccatgtcaaa acaaggtcag ataacaactc     180
catcgatctc atcctggatc agaattcagg ggcaggattt gcctccaaga atcagtacat     240
gtttggactt gtaagcatga acatcaaact tgtggcgggt gattctgcag ggacagtcac     300
tgctttttat atgagctcgg acaaggagga agtgcgagat gaattggatt tcgagtttct     360
ggggaacaga tcaggccagc cttatacagt ccaaacaaat gtgtttgctc tcgggaaggg     420
tggccgcgag cagagagtga atctctg                                         447
```

<210> 830
<211> 471
<212> DNA
<213> Pinus radiata

<400> 830

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tgtttaagaa tgcagagttg ctgcttcttc attctggttt tttgcttctg ggtatctaat      60
tgtgcagagt tcaatgatat cttcgagccc agctgggcga ttgatcatgt tatgaacgag     120
ggagagctgt tgaagctgaa gctcgacaac ttttctggcg ctggcttttc ttccaaggca     180
acatacttgt ttggaaaagt aggggcgcag attaaactcg ttcccggcga ctctgcgggc     240
acagtgactg cattttatat gtcttctgag gggacattgc atgacgaatt cgatttcgaa     300
ttcttgggaa atgcttcggg tgagccttac attgtgcaga ctaatatcta ctccaatggc     360
actggcaaca gggaacaacg catttacctc tggttcgacc ccaccgcaga tttccattcc     420
tattcttttc tgtggaacca caagcaagtt gtattctttg tagacagtgt t              471
```

<210> 831
<211> 391
<212> DNA
<213> Pinus radiata

<400> 831

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taggatggcc gggcaaagga attggttcaa gagaatcgag tttattgtta tattcgtggt      60
ttgcttaaac tctgtttctg cacgcccggc atcatttgca gaggatttta aagtgacgtg     120
ggcagatgac catgtcaaaa caaggtcaga taacaactcc atcgatctca tcctggatca     180
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gaattcaggg gcaggatttg cctccaagaa tcagtacatg tttggacttg taagcatgaa 240
catcaaactt gtggcgggtg attctgcagg gacagtcact gctttttata tgagctcgga 300
caaggaggaa gtgcgagatg aattggattt cgagtttctg ggaacagat caggccagcc 360
ttatacagtc caaacaaatg tgtttgctct c 391

<210> 832
<211> 304
<212> DNA
<213> Pinus radiata

<400> 832
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tggaacttgg tccacgaaaa acacaatctg atgagcgttc cagaggatag agtaagtgtg 120
aaactctgtc gttggatcga accagaggat atgcctctgt tcccttccac ccacaccatt 180
tgaatagatg ttcgtctgaa gaccataagg ctgtccactt ctgttcccta gaaattcaaa 240
atctagctcg tccctattca tgtctgtgtc agaagacata taataagcag tgacaactcc 300
tgca 304

<210> 833
<211> 234
<212> DNA
<213> Pinus radiata

<400> 833
acccatttaa ccagccgatg aagatctatt cgagcctgtg gaatgctgat gactgggcca 60
cccgaggggg tctggagaaa accgactggg ccaaggcgcc cttcatcgcc tcctacaggg 120
aattccacgt cgatgcctgt gaggcttctg ctccgcaatc ggtgtgcgct acgcaggggc 180
ggnggtggtg ggatcaggag gagttcagag acctggatgg gcggcaatgg cggt 234

<210> 834
<211> 375
<212> DNA
<213> Pinus radiata

<400> 834
ggagcattcg cctttgtaat ggagtaaggg aagaatgaga gggcctgtcc caccacttac 60
ttccattttt aataacccct cttggttctc catttaatcc gtatttgttt gcatcaatgt 120
tgaagccttt gtaagtggag ataaaaggag aatggctcca gtttatcttc agccgcccac 180
cttgagtagc ccagttatct gcattccaga ttgaagagga taccctcatg ggctgtttct 240
taggatatgg gactcccagc ctctcgttgt tggggaatac cctaatcgga acactgtcta 300
caaagaatac aacttgcttg tggttccaca gaaaagaata ggaatggaaa tctgcggtgg 360
ggtcgaacca gaggt 375

<210> 835
<211> 352
<212> DNA
<213> Pinus radiata

<400> 835
gcagctttct cttgacaaat ggacaggtac tggcttccaa tccaagggta gctacttgtt 60
tggacatttc agtatgcaga taaagatggt tcctggtgac tctgcaggcg ttgtgactgc 120
cttttattta tcctctcaga actctgaaca tgatgaaata gactttgagt tcttgggcaa 180
taggtctgga caaccttaca ttctccaaac taatgttttc agtggaggaa agggggacag 240
agagcaacgc gtatatctct ggtttgaccc cacaaaagac tatcattcct acactgtcct 300
ttggaatatg catcagattg tattctttgt ggatgatgtc cccatcagag tt 352

<210> 836

<211> 368
<212> DNA
<213> Pinus radiata

<400> 836
ctataagtcc ggattcttca gtgctgctat taagctacag gcaggttata cagctggagt 60
cattgcagca ctctatctct ccaataacca ggagtaccca ggtcaccatg acgaaataga 120
cattgagttc ctggggacaa caccaggaaa accctacacc ttacagacca atgtttacat 180
aaatggaaca ggggatgggc aggttctcac aggcagggag ttgaagtttc atctctggtt 240
tgacccaact gaagacttcc ataactacag ccttctctgg actccaagtt atatcatctt 300
ctatgtagat gatattgcta tccgaaagta cccaagaaga atttcatcta cttatccatt 360
gaggccac 368

<210> 837
<211> 402
<212> DNA
<213> Pinus radiata

<400> 837
ggagcattcg cctttgtaat ggagtaaggg aagaatgaga gggcctgtcc caccacttac 60
ttccattttt aataacccct cttggttctc catttaatcc gtatttgttt gcatcaatgt 120
tgaagccttt gtaagtggag ataaaaggag aatggctcca gtttatcttc agccgcccac 180
cttgagtagc ccagttatct gcattccaga ttgaagagga taccctcatg ggctgtttct 240
taggatatgg gactcccagc ctctcgttgt tggggaatac cctaatcgga acactgtcta 300
caaagaatac aacttgcttg tggttccaca gaaaagaata ggaatggaaa tctgcggtgg 360
ggtcgaacca gaggtaaatg cgttgttccc tgtcgccagt gc 402

<210> 838
<211> 389
<212> DNA
<213> Pinus radiata

<400> 838
cacagactcg ttgggtgctt actgaaagat agctagcagg aggctggtgc ttttctagac 60
aatgctgatc aatatggtgc ccaatgtact gttatttctc ttggtagcgg caatggctgc 120
tactgctacc tcacctccga agcctgtgga tgtgccattc caaaaaaact atgtacccac 180
ctgggcttct gatcatatca agtacattaa tggggggaac gaagcgcagc tttctcttga 240
caaatggaca ggtactggct tccaatccaa gggtagctac ttgtttggac atttcagtat 300
gcagataaag atggttcctg gtgactctgc aggcgttgtg actgcctttt atttatcctc 360
tcagaactct gaacatgatg aaatagact 389

<210> 839
<211> 451
<212> DNA
<213> Pinus radiata

<400> 839
ggatttagga gtgaggtatc cattcaacca gcccatgaaa atctattcaa gcttgtggaa 60
tgctgatgac tgggctacaa ggggtgggtt ggagaagaca gactggagca aggcaccctt 120
tgttgcatca tacaagggat tccacgtgga tgggtgtgag gcgtctatgc ctcactctgc 180
ttgtccaact ttaggccgtc gatggtggga tcagaaagcc ttcgatgacc ttgatggaca 240
gcaatggagg aaactgaagt gggttcgtga taggtacacc atatacaact actgcactga 300
cagagtgagg tatcctaaaa tgtctccaga gtgtaccana gaccgtgaca tctaatagca 360
cagcctcctt gggatagata gctatatttt tattctattc ttcttcgaca tatggctgtt 420
ctaattatgt tataactgcc atttcgtagt a 451

<210> 840

<211> 459
<212> DNA
<213> Pinus radiata

<400> 840
gaataatttc aggtagtgga ttcaagtctt tggaggccta taagtccgga ttcttcagtg 60
ctgctattaa gctacaggca ggttatacag ctggagtcat tgcagcactc tatctctcca 120
ataaccagga gtacccaggt caccatgacg aaatagacat tgagttcctg ggacaacac 180
caggaaaacc ctacacctta cagaccaatg tttacataaa tggaacaggg gatgggcagg 240
ttctcacagg cagggagttg aagtttcatc tctggtttga cccaactgaa gacttccata 300
actacagcct tctctggact ccaagttata tcatcttcta tgtagatgat attgctatcc 360
gaaagtaccc aagaagaatt tcatctactt atccattgag gccactttgg gtatatggat 420
caatatggga tgcttcctct tgggctactg aaaatggca 459

<210> 841
<211> 476
<212> DNA
<213> Pinus radiata

<400> 841
tttttttttt gaatcatcaa aagaatctcg cttttgtatt accagtaccc taaatgaatt 60
gattgatacc ctctaatatt ttacatgtgt gtctgagaaa gaatgaaaga attaatgtaa 120
tagaaatgaa tcagaatact tggaaggaaa gaattcagag ttcattctct gaattcaaag 180
gattgaggtt ttatttgcat tcgggaggcg gtccctgggg gaatctcttg gtgtctgcac 240
aataatcgta gatcatgtag ttctttcgta cccactgtag cctctgcctc tgttcttgct 300
tcgattccaa agccacctcc tctgcggcgg cgtcaaaaga agaagtagcg gcagcattga 360
aattgcggaa ggatgcaaca aagggagctt tagtccagtc ggtcttcaca agcccacccc 420
tggttgccca atcatctgca ttccaaaggc tggagtagac cctcattgct ttgggt 476

<210> 842
<211> 293
<212> DNA
<213> Pinus radiata

<400> 842
ggctgatcat ggcagtaatc gtaagtcaaa tatttgctgt tcacccacct gtaatattcc 60
ctctgtttct tcgtcagagt ccgcgcctcg ggcttatccc accagtgcct tgcacttgca 120
ttattactgt gagcacagga cgattgggtc gtgttttgat cctcccattt gcagccgagg 180
ccatggaatt tcttgtacga agatacgaac ggagcagccg cccagttggt cttctcaagg 240
ccgcctctcg ttgcccagtt gtctccattc caaatgctgg agaacatgta cat 293

<210> 843
<211> 460
<212> DNA
<213> Pinus radiata

<400> 843
gtgttgattg gtctgattgc ctgtgtttct tgccagtccg acggtgatga ttcatctccc 60
aaggtttttg atgataattt tcagatattg tgggctcagg atcacttcag gacctctgaa 120
aatggtcaag tatggcacct ggttcttgac cagaactcag gttctgggtt caaatcgaag 180
aacaagtata gattcggatg gttcagcatg aagctcaagc tcgtaccagg agactctgca 240
ggagttgtca ctgcttatta tatgtcttct gacacagaca tgaataggga cgagctagat 300
tttgaatttc tagggaacag aagtggacag ccttatggtc ttcagacgaa catctattca 360
aatggtgtgg gtggaaggga acagaggcat atcctctggt tcgatccanc gacagagttt 420
tacacttact ctatcctctg gaacgctcat cagattgtgt 460

<210> 844

<211> 491
<212> DNA
<213> Pinus radiata

<400> 844
tggtgactct gcaggcgttg tgactgcctt ttatttatcc tctcagaact ctgaacatga 60
tgaaatagac tttgagttct tgggcaatag gtctggacaa ccttacattc tccaaactaa 120
tgttttcagt ggaggaaagg gggacagaga gcaacgcgta tatctctggt ttgaccccac 180
aaaagactat cattcctaca ctgtcctttg gaatatgcat cagattgtat tctttgtgga 240
tgatgtcccc atcagagttt tcaagaacag caaggattta ggagtgaggt atccattcaa 300
ccagcccatg aaaatctatt caagcttgtg gaatgctgat gactgggcta caaggggtgg 360
gttggagaag acagactgga gcaaggcacc ctttgttgca tcatacaagg gattccacgt 420
ggatgggtgt gaggcgtcta tgcctcactc tgcttgtcca actttaggcc cgtcgatggt 480
gggatcaaga a 491

<210> 845
<211> 413
<212> DNA
<213> Pinus radiata

<400> 845
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taggcaatgc tgattaatat ggtgcccaat gtactgttat ttctcttggt agcggcaatg 120
gctgctactg ctaccccacc tccgaagcct gtggatgtgc cattccaaaa aaactatgta 180
cccacctggg cttctgatca tatcaagtac attaatgggg ggaacgaagc gcagctttct 240
cttgacaaat ggacaggtac tggcttccaa tccaagggta gctacttgtt tggacatttc 300
agtatgcaga taaagatggt tcctggtgac tctgcaggcg ttgtgactgc cttttattta 360
tcctctcaga actctgaaca tgatgaaata gactttgagt tcttgggcaa tag 413

<210> 846
<211> 513
<212> DNA
<213> Pinus radiata

<400> 846
gggagacaga gttgggtaaa gtggatagca attatcatta tcccaaaacc caagcaatga 60
gggtctactc cagcctttgg aatgcagatg attgggcaac caggggtggg cttgtgaaga 120
ccgactggac taaagctccc tttgttgcat ccctccgcaa tttcaatgct gccgctactt 180
cttcttttga tgccgtcgca gaggaggtgg ctttggaatc gaaccaagaa cagaggcaga 240
ggctccagtg ggtacgaaag aactacatga tctacgatta ttgtgcagac accaagagat 300
tcccccaggg accgcctccc gattgcaaat aaaacctcaa tcctttgaat tcagagaatg 360
aactctgaat tctaccttcc aagtattctg attcatttct attacattaa ttctcattct 420
ttctcagaca cacatgtaaa atattagagg gtatcaatca tttcattttg gtactgctat 480
acaaaagcga gattcttttg atgaaaaaaa aaa 513

<210> 847
<211> 362
<212> DNA
<213> Pinus radiata

<400> 847
ctacacctta cagaccaatg tttacataaa tggaacaggg gatgggcagg ttctcacagg 60
cagggagttg aagtttcatc tctggtttga cccaactgaa gacttccata actacagcct 120
tctctggact ccaagttata tcatcttcta tgtagatgat attgctatcc gaaagtaccc 180
aagaagaatt tcatctactt atccattgag gccactttgg gtatatggat caatatggga 240
tgcttcctct tgggctactg aaaatggcaa atacagagca gattacagat atcagccatt 300
tgttgctaag ttctctaagt tcattctcag tggctgccct gtttcagact ccacatgctc 360

ag 362

<210> 848
<211> 417
<212> DNA
<213> Pinus radiata

<400> 848
ctcgtttctg gaactgctgc tctgcatcac aaactctttt cccaatccct aatcgacatc 60
gacatcgaca tcgacatcga cacacctctt cacctcctct ttcttttatt ggcctcctcg 120
gcagctcttg cttctgcaaa tttctacaat gatgtcgaca ttacatgggg taatgatcgt 180
gctaaaatca ttgacaatgg acaagagttg cagcttactc ttgaccgctc ttcaggttgt 240
ggtattcaat ccaagcaaga gtatctattt gccaagattg atatccaaat caagttggta 300
cctggcaact ctgcaggcac agtcactacc ttttatctat catctcaagg tcccaaacac 360
gacgaaatag acttcgaatt tctgggcaac ctgtccggag atccttatat tttgcac 417

<210> 849
<211> 291
<212> DNA
<213> Pinus radiata

<400> 849
atattatgca cactaatgtc ttcgctcaag gccttggtaa tcgtgagcaa caattttact 60
tgtggttcga cccaaccttg gatttccaca cttactccgt gctctggaca tcaaaccaaa 120
tcatattctc tgtagacgag actcccgttc gagtgtttaa gaacagggag acagagttgg 180
gtaaagtgga tagcaattat cactatccta agagccaagc aatgaaggtc tattcaagcc 240
tctggaatgc agatgattgg gcgactagag gtggactcgt caagacagac t 291

<210> 850
<211> 299
<212> DNA
<213> Pinus radiata

<400> 850
actgtcccaa ggggagccgc tccagctcaa gctcgatccc gcttctggtg cagggtttgc 60
ttccaagcac acatacattt tcggaaaagt gaatgggcaa attaaactcg ttcctggaga 120
ctctgctggc accggtattg ctttctatat gtcttcccaa ggggacgaac acgatgaatt 180
tgactttgaa tttttgggta acatttctgg acagccatac actgtgcaga ccaatgttta 240
ttcaaaaggc agtggcaata gggagcaacg catgttcttg tggtttgacc caactgtag 299

<210> 851
<211> 359
<212> DNA
<213> Pinus radiata

<400> 851
gtgttcagta gtctgattgc tagtgtttgt tcccagtccc aaggggatga ttcatctgct 60
aaggtttttg atgataattt tcagataatg tgggctgagg atcatttcag gacctctgaa 120
aatggccaag tatggcacct ggttcttgac cagaactcag gttctgggtt caagtccaag 180
tataagtaca gattcggatg gtttagcatg aagctcaagc tcgtaccggg agactctgca 240
ggagttgtca ctgcttatta tatgtcttct aacaccgaca tgaataggga cgagctggac 300
tttgagtttc tggggaacag aagtggagag ccatatgctc tgcagacaaa catctatgc 359

<210> 852
<211> 347
<212> DNA
<213> Pinus radiata

<400> 852
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ccctcgggtg gcccagttat ccgcattcca caggctcgaa tagatcttca ttggttggtt 120
gaaagggaac cttatcccca ggttcttgca gttcttgaac acgcggattg gtaccgagtc 180
cacaaaaaaa ctgcacaaaa aacccatcac acacatcaat attcatgaac gttccagtgc 240
caaattttga aaagtttttt tggtttttta ggattttatt tgtttagaat tttggaagga 300
ttgtgaattt ttcagaataa aaatatttaa aaaattttca aatatct 347

<210> 853
<211> 434
<212> DNA
<213> Pinus radiata

<400> 853
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ctattcgagc ctgtggaatg ctgatgactg ggccacccga gggggtctgg agaaaaccga 120
ctgggccaag gcgcccttca tcgcctccta cagggaattc cacgtcgatg cctgtgaggc 180
ttctgctccg caatcggtgt gcgctacgca ggggcggcgg tggtgggatc aggaggagtt 240
cagagacctg gatgggcggc aatggcggta cttgaaatgg gtgaggaagc actacaccat 300
ctacaattac tgcactgaca cgcccagaaa caagcaaatg cctccggaat gtgttcgcga 360
tcgcgacaat atgtagtcca gttatcctca tcatttgatg ctacccatgg ctgaataatc 420
cgtggtcgga taat 434

<210> 854
<211> 274
<212> DNA
<213> Pinus radiata

<400> 854
attcaatcca agcaagagta tctatttgcc aagattgata tccaaatgaa gttggtacct 60
ggcaactctg caggcacagt cactactttt tatctatcat ctcaaggtcc caaacacgac 120
gaaatagact ttgaatttct gggaaacctg tctggagatc cttatatttt gcacactaat 180
gtctttgctc aaggccttgg tggacgtgag cagcaatttt acttgtggtt cgacccaacc 240
ctggatttcc acacttactc cgtgctctgg actt 274

<210> 855
<211> 366
<212> DNA
<213> Pinus radiata

<400> 855
ataagctgtt gttaaaatgg cttctttgag tatgcagagc tgcttcttaa ttctggctct 60
ttgcttctgg gcatccccatt gtgcacagtt taatgatatc ttcgagccca gctgggcgac 120
agatcatgtt atgtatgagg gagagctgtt gaagcttaag ctggacaata tttccggggc 180
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tccaggtgac tctgcaggca cagttactgc tttttatatg tcttctgagg ggactctgca 300
cgacgaattc gatttcgaat tcttgggaaa tgcttcgggt gagccttaca ttgggcagac 360
gaatat 366

<210> 856
<211> 398
<212> DNA
<213> Pinus radiata

<400> 856
gtccagtcga atcgggtctn gaggatggca ttcgtaggtt gtcaagaagg gggtcgtgac 60

atgcactgng ctcttctttg tatctttgta acgttgtgca acctgctcgt gagctctcaa 120
tgtgcgtnct tngacgattt cttctacccc agttgggctg ttgatcatgt catgtcccaa 180
ggagagttgc tccagctcaa gcttgataac atttctggtg caggatttgc ttngaagagc 240
acatacatct tcggaaaagc aaatgtgcag ataaagctcg ttcccgggga ctctgctggc 300
actgttactg cattctatat gtcttcccaa ggcgatcagc atgacgaatt cgactttgaa 360
tttttgggga acacttttgg ggagccgtac gctgtgca 398

<210> 857
<211> 183
<212> DNA
<213> Pinus radiata

<400> 857
cagtacatgt ttggacttgt aagcatgaac atcaaacttg tggcgggtga ttctgcaggg 60
acagtcactg ctttttatat gagctcggac aaggaggaag tgcgagatga attggatttc 120
gagtttctgg ggaacagatc aggccagcct tatacagtcc aaacaaatgt gtttgctctc 180
ggg 183

<210> 858
<211> 464
<212> DNA
<213> Pinus radiata

<400> 858
cagactcgtt gggtgcttac tgaaagatag ctagcaggag gctggtgctt ttctaggcaa 60
tgctgatcaa tatggtgccc aatgtactgt tatttctctt ggtagcggca atggctgcta 120
ctgctacccc acctccgaag cctgtggatg tgccattcca aaaaaactat gtacccacct 180
gggcttctga tcatatcaag tacattaatg gggggaacga agcgcagctt tctcttgaca 240
aatggacagg tactggcttc caatccaagg gtagctactt gtttggacat ttcagtatgc 300
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agaactctga acatgatgaa atagactttg agttcttggg caataggtct ggacaacctt 420
acattctcca aactaatgtt ttcagtggag gaaaggggga caga 464

<210> 859
<211> 412
<212> DNA
<213> Pinus radiata

<400> 859
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accaaattat attttctgta gacgggagtc ctgttcgagt gtttaagaac agggagacag 120
agttgggtaa agtggatagc aattatcatt atcccaaaac ccaagcaatg agggtctact 180
ccagcctttg gaatgcagat gattgggcaa ccaggggtgg gcttgtgaag accgactgga 240
ctaaagctcc ctttgttgca tccctccgca atttcaatgc tgccgctact tcttcttttg 300
atgccgccgc agaggaggtg gctttggaat cgaaccaaga acagaggcag aggctccagt 360
gggtacgaaa gaactacatg atctacgatt attgtgcaga caccaagaga tt 412

<210> 860
<211> 376
<212> DNA
<213> Pinus radiata

<400> 860
acgatgagat agactttgaa ttcttgggga acaagtcggg ggaaccctac attcttcaga 60
ccaatgtatt tacgggcggg aagggtgaga gagagcaccg aatatacctc tggttcgacc 120
ccaccaagga ttaccattcc tatgctgtgc tctggaacat gtaccaaatt gcatttttgg 180
tagatgaggt accaatccgg gtgttcaaga acagcaagga tctgggcgtg aggtacccat 240

ttaaccagcc gatgaagatc tattcgagcc tgtggaatgc tgatgactgg gccacccgag 300
ggggtctgga gaaaaccgac tgggccaagg cgcccttcat cgcctcctac agggaattcc 360
acgtcgatgc ctgtga 376

<210> 861
<211> 536
<212> DNA
<213> Pinus radiata

<400> 861
gacatggctt gtttaagatt gcagagctgc tgctttttcg ttctggtttt ttgcttctgg 60
gtatctaatt gtgcagagtt caatgatatc ttcgagccca gctgggcgat tgatcatgtt 120
atgaacgagg gagagctgtt gaagctgaag ctcgacaatt tttctggcgc tggcttttct 180
tccaaggcca catacttgtt tggaaaagta ggggcgcaga ttaaactcgt tcccggcgac 240
tctgcgggca cagtgactgc attttatatg tcttctgagg ggacattgca tgacgaattc 300
gatttcgaat tcttgggaaa tgcttcgggt gagccttaca ttgtgcagac taatatctac 360
tccaacggca ctggcgacag ggaacaacgc atttacctct ggttcgaccc caccgcagat 420
ttccattcct attctttct gtggaaccac aagcaagttg tattctttgt agacagtgtt 480
ccgattaggg tattccccaa caacgagagg ctgggagtcc catatcctaa gaaaca 536

<210> 862
<211> 358
<212> DNA
<213> Pinus radiata

<400> 862
gctatatctc ccacagttta tgcagacgtc tacagtgata ttgatgtaac atggggcgaa 60
aataacgctt gggtattgaa caatggccag ggattgcagc tttctcttac caattattct 120
ggttcgggat ttcaatcgta taaggagttt ttgtttggaa gcgttgatat ctccatgaaa 180
ctggtgcccg gaaattccgc cggtaccgtt acgacatatt atctatcttc aacaggtgag 240
gggcacgacg aaattgatat ggagttccta ggaaatgttt ctggggagcc ctacattctg 300
catacaaaca tttatgtcaa tggttcagcc cgataaagag cagcagttct atttatgg 358

<210> 863
<211> 322
<212> DNA
<213> Pinus radiata

<400> 863
acgatgagat agactttgaa ttcttgggga acaagtcggg ggaaccctac attcttcaga 60
ccaatgtatt tacgggcggg aagggtgaga gagagcaccg aatatacctc tggttcgacc 120
ccaccaagga ttaccattcc tatgctgtgc tctggaacat gtaccaaatt gcatttttgg 180
tagatgaggt accaatccgg gtgttcaaga acagcaagga tctgggcgtg aggtacccat 240
ttaaccagcc gatgaagatc tattcgagcc tgtggaatgc tgatgactgg gccacccgag 300
ggggtctgga gaaaaccgac tg 322

<210> 864
<211> 372
<212> DNA
<213> Pinus radiata

<400> 864
tccatttccg cgtgcccggc tgatcaggtc ttcatttttc tgcaaaataa tttcattttg 60
tgtaacatcg atgtgctcgg aagcgatgaa gactgcccaa tttctgggtc tgtttctcat 120
tctactactc cattctgctg ccatggctgc cacgcccaag ccagtgagtg tgcccttcgg 180
caaaaattac ggtgcaagct ggggctcaga ccacatcaaa gaattccatg gaggtcgaaa 240
ggtcgaactt cttctcaaca aacagtatgg tgcggggttc gaatccaagg ggacatattt 300

gtttgggcat ttcagcatgc agattaagtt ggttcctggt gactcggctg gcactgtcac 360
ggccttctat ct 372

<210> 865
<211> 519
<212> DNA
<213> Pinus radiata

<400> 865
ataatggctt gtttaagaat gcagagttgc tgcttcttca ttctggtttt ttgcttctgg 60
gtatctaatt gtgcagagtt caatgatatc ttcgagccca gctgggcgat tgatcatgtt 120
atgaacgagg gagagctgtt gaagctgaag ctcgacaact tttctggcgc tggcttttct 180
tccaaggcaa catacttgtt tggaaaagta ggggcgcaga ttaaactcgt tcccggcgac 240
tctgcgggca cagtgactgc attttatatg tcttctgagg ggacattgca tgacgaattc 300
gatttcgaat tcttgggaaa tgcttcgggt gagccttaca ttgtgcagac taatatctac 360
tccaacggca ctggcaacag ggaacaacgc atttacctct ggttcgaccc caccgcagat 420
ttccattcct attcttttct gtggaaccac aagcaagttg tattctttgt agacagtgtt 480
ccgattaggg tattccccaa caacgagagg ctgggagtc 519

<210> 866
<211> 240
<212> DNA
<213> Pinus radiata

<400> 866
ctctcatcac agggttcgaa ccgcgacgag ctggatttcg agtttctggg gaataaatct 60
ggagatccta ccattcttca aactaatgta tacgcaaatg gaaaaggcga ccgcgagcag 120
cgaatatacc tctggtttga tccatccact gaattccaca cctaccgtgt tatctggaac 180
gctgcgtata tcttatttat ggtggatgag gtgcctgtta gagtttttat gaacaacaac 240

<210> 867
<211> 392
<212> DNA
<213> Pinus radiata

<400> 867
tgtttgcaga gatttgttgg ggcaatgctg atcaagatgg tccccaaact gttgctggtg 60
ctcttggtag ctgcaatggc tgctatggct gcctcacctc ctaagcctgt ggacgtacca 120
ttcccaaaaa attatgtacc cacttgggct gctgatcata tcaagtacat caatggtgga 180
aatgaggttc agctttctct agacaaatgg acaggtactg gcttccaatc caagggtacc 240
tacttgtttg gacactttag tatgcagata aagatggttc ctggtgactc tgcaggcact 300
gtgactgcct tttatctatc ctcccagaat gccgagcacg atgaaataga ttttgagttc 360
ctgggcaata ggtctggaca gccttacatt ct 392

<210> 868
<211> 605
<212> DNA
<213> Pinus radiata

<400> 868
cgtgcccggc tgatcaggtc ttcatttttc tgcaaaataa tttcattttg tgtaacatcg 60
atgtgctcgg aagcgatgaa gactgcccaa tttctgggtc tgtttctcat tctactactc 120
cattctgctg ccatggctgc cacgcccaag ccagtgagtg tgcccttcgg caaaaattac 180
ggtgcaagct ggggctcaga ccacatcaaa gaattccatg gaggtcgaaa ggtcgaactt 240
cttctcaaca aacagtatgg tgcggggttc gaatccaagg ggacatattt gtttgggcat 300
ttcagcatgc agattaagtt ggttcctggt gactcggctg gcactgtcac ggccttctat 360
ctttcttctc aaactgcaga gcacgacgag atagatttcg aatttttggg caacaggtct 420

ggacaacctt acattcttca gaccaatgta ttcacaggag gcaagggtga gagagagcat 480
cgcatatatc tctggttcga tcccaccaag gattaccatt cctatgcagt actctggaac 540
atgtaccaga tcgtgttttt tgtggactcg gtaccaatcc gcgtgttcaa gaactgcaag 600
gacct 605

<210> 869
<211> 528
<212> DNA
<213> Pinus radiata

<400> 869
atgaattcga tttcgaattc ttgggaaatg cttcgggtga gccttacatt gtgcagacta 60
atatctactc caacggcact ggcaacaggg aacaacgcat ttacctctgg ttcgacccca 120
cggcagattt ccattcctat tctttttgt ggaaccacaa gcaagttgta ttctttgtag 180
acagtgttcc gattagggta ttccccaaca acgagaggct gggagtccca tatcctaaga 240
aacagcccat gagggtatcc tcttcaatct ggaatgcaga taactgggct actcaaggtg 300
ggcggctgaa gataaactgg agccattctc cttttatctc cacttacaaa aggttcgaca 360
tcgatgcaaa ccaatacgga ttaaatggag aatcgagagg ggttattgag aatggaagta 420
agtggtggga caggccctct cattcttccc ttactccatt acaaaggcga atgctccgat 480
gggtggatcg gaactatatc atctatgact actgcaagga ttcgacca 528

<210> 870
<211> 277
<212> DNA
<213> Pinus radiata

<400> 870
ggaacatgta ccagatcgtt ttttttgtgg actcggtacc aatccgcgtg ttcaagaact 60
gcaagaacct ggggataagg ttccctttca accaaccaat gaagatctat tcgagcctgt 120
ggaatgcgga taactgggcc acccgagggg gtctggagaa aaccgattgg agcaaggcgc 180
ccttcaccgc ctcctacaag caattccacg tcgatgcctg cgaagcttct gtttcggagt 240
cggtgtgcgc tacgcagggg cggcggtggt gggatca 277

<210> 871
<211> 501
<212> DNA
<213> Pinus radiata

<400> 871
caacaattat gtcgccagct ggggctcaga tcacatcaaa caattccatg gcggtcgaaa 60
gactgagctg ctcctcaaca aacagtatgg tgcggggttt gagtcgaagg ggacatattt 120
atttgggcat ttcagtatgc agataaagct ggttgccggt gattccgctg gcactgtcac 180
cgccttttat ctttcttctc agactgcaga gcacgatgag atagactttg aattcttggg 240
gaacaagtcg gggggaaccct acattcttca gaccaatgta tttacgggcg ggaagggtga 300
gagagagcac cgaatatacc tctggttcga ccccaccaag gattaccatt cctatgctgt 360
gctctggaac atgtaccaaa ttgcattttt ggtagatgag gtaccaatcc gggtgttcaa 420
gaacagcaag gatctgggcg tgaggtaccc atttaaccag ccgatgaaga tctattcgag 480
cctgtggaat gctgatgact g 501

<210> 872
<211> 540
<212> DNA
<213> Pinus radiata

<400> 872
gcgattctat tctaagcaga ccagggattc gattggagcc ttcagcatta tctgctaaat 60
ttgatcgata tcgtttgcat ctatggaggt ttctagggct ttaagttatg tccatttcct 120

tttgattgcc attatctgca cagttatatc tcccacagtt tatgcagacg tctacagtga 180
tattgatgta acatggggcg aaaacaacgc ttgggtattg aacaatggcc agggattgca 240
gctttctctt accaattatt ctggttcggg atttcaatcg tataaggagt ttttgtttgg 300
aagcgttgat atctccatga aactggtgcc cggaaattcc gctggtaccg ttacgacata 360
ctatttatct tctacaggtg aggggcacga cgaaattgat atggagtttt taggaaatgt 420
ttccgggcag ccttacattc tgcacacaaa catttatgtc aatggctcag ccaataaaga 480
gcagcagttc tatttatggt tcgatccaac ttcagatttc cacaattact ccattctctg 540

<210> 873
<211> 397
<212> DNA
<213> Pinus radiata

<400> 873
gcccggctga tcaggtcttc atttttctgc aaaataattt cattttgtgt aacatcgatg 60
tgctcggaag cgatgaagac tgcccaattt ctgggtctgt ttctcattct actactccat 120
tctgctgcca tggctgccac gcccaagcca gtgagtgtgc ccttcggcaa aaattacggt 180
gcaagctggg gctcagacca catcaaagaa ttccatggag gtcgaaaggt cgaacttctt 240
ctcaacaaac agtatggtgc ggggttcgaa tccaagggga catatttgtt tgggcatttc 300
agcatgcaaa ttaagttggt tcctggtgac tcggctggca ctgtcacggc cttctatctt 360
tcttctcaaa ctgcagagca cgacgagata gatttcg 397

<210> 874
<211> 371
<212> DNA
<213> Pinus radiata

<400> 874
ataagctgtt gttaaaatgg cttctttgag tatgcagaac tgcttcttaa ttctggctct 60
ttgcttctgg gcatcccatt gtgcacagtt taatgatatc ttcgagccca gctgggcgac 120
agatcatgtt atgtatgagg gagagctgtt gaagcttaag ctggacaata tttccggggc 180
tggctttgct tccaagacaa catatttgtt tggaaaagca ggggcacaga ttaagctcgt 240
tccaggtgac tctgcaggca cagttactgc tttttatatg tcttctgagg ggactctgca 300
cgacgaattc gatttcgaat tcttgggaaa tgcttcgggt gagccttaca ttgtgcaaac 360
gaatatctac t 371

<210> 875
<211> 355
<212> DNA
<213> Pinus radiata

<400> 875
ctttgtagac gatgtgcccg tacgggtatt tgggaacaat gagaaagtgg gagtcccgta 60
tcctcaatct caaccaatgg gcgtatactc ttcaatatgg aacgcagacg actgggctac 120
tcaaggtggc ctcgtcaaga ccgattggag ccacgcacct ttcgtttcca catacacaaa 180
tttcagcatc gatgcctgtg attattcctt gaaaacgacc tgctcttcgt ggtgggatga 240
gcctgcttac gcttcgctcg atgcaaagca gaggctgaaa ctgaagtggg tgcaagagaa 300
atacatgact tacgattact gcaaagattt agccaggttt cccacggctc cgcca 355

<210> 876
<211> 337
<212> DNA
<213> Pinus radiata

<400> 876
gcagagattt gttgggtaag ggcaatgctg atcaagatgg tccccaaact gttgctggtg 60
ctcttggtag ctgcaatggc tgctatggct gcctcacctc ctaagcctgt ggacgtacca 120

ttcccaaaaa attatgtacc cacttgggct gctgatcata tcaagtacat caatggtgga 180
aatgaggttc agctttctct agacaaatgg acaggtactg gcttccaatc caagggtacc 240
tacttgtttg gacactttag tatgcagata aagatggttc ctggtgactc tgcaggcact 300
gtgactgcct tttatctatc ctcccagaat gccgagc 337

<210> 877
<211> 558
<212> DNA
<213> Pinus radiata

<400> 877
gggtagcagc gtagtgcaga taagctgttg ttaaaatggc ttctttgagt atgcagagct 60
gcttcttaat tctggctctt tgcttctggg catcccattg tgcacagttt aatgatatct 120
tcgagcccag ctgggcgaca gatcatgtta tgtatgaggg agagctgttg aagcttaagc 180
tggacaatat ttccggggct ggctttgctt ccaagacaac atatttgttt ggaaaagcag 240
gggcacagat taagctcgtt ccaggtgact ctgcaggcac agttactgct ttttatatgt 300
cttctgaggg aactctgcac gacgaattcg atttcgaatt cttgggaaat gcttcgggtg 360
agccttacat tgttcagacg aatatctact ccaacggcac tggcaaaagg gaacaacgta 420
tttacctctg gttcgacccc acggcagatt tccattccta ttcttttcta tggaaccaca 480
accaagttgt ttctttgtg gatagtgttc cgattcgggt attccccaac aacgagcggc 540
tgggagtccc atatccga 558

<210> 878
<211> 400
<212> DNA
<213> Pinus radiata

<400> 878
tttttttttt tttttttagg aaacacctta ttcgttgctg attggcttta ttaatatttc 60
aagcattaca gagataagtc atcttgtgac tgcaaaacag taacgatgac ataaataaca 120
aagcatatct aagaagaata gattacagaa gatatattaa tatatctata aataagagcc 180
cctaagaggc tgctattaaa tgtcacggtc tctggtacac tctggaggca ttgctggaga 240
cctcactttg tcagcgcagt agttatagat ggtgtaactg ttacgaaccc ccttcagttt 300
tctccattgc attccatcaa ggtcatcgaa ggccttttga tcccaccacc gacgaccctg 360
agtagcacaa gtcgactcag tacagaggcc tcacacccat 400

<210> 879
<211> 500
<212> DNA
<213> Pinus radiata

<400> 879
agatccctat attatgcaca ccaatatctt cgctcaaggc cttggcaatc gtgaacagca 60
attctacttg tggttcgacc caaccctggc ttttcacact tactccgtgc tctggacacc 120
aaatcaaatt acattgtccg tggacgggat tcctgttcgt gtgtttaaaa acagggagac 180
agaattggat aaaacagata gcaattatca ttatccgaag agccaagcaa tgaggatgta 240
ctccagcctt tggaatgcag atgattgggc aaccagaggt ggcctcgtca agacagactg 300
gactaaagcc cccttttgttg catctttcag caacttcagt gctgcgactt cttcttctaa 360
cttcgacgga gaggatgttt tggattcgaa cgaagagcag aagcttcaat gggtgcgaaa 420
gaactatatg atctacgatt actgtgcaga cacaaaaagg ttcccccagg ggctacctgc 480
agaatgcaaa tgagcgctct 500

<210> 880
<211> 547
<212> DNA
<213> Pinus radiata

<400> 880
atgctgtgca gcctggtagt gggctctcaa tgtgcagcct tcaacgatct tttctacgcc 60
agtgggctgc tgaccatgtt atgtcccagg gcgatttgct ccagctcaag ctcgatcaca 120
cttctggtgc aggatttgct tcgaagagca catacttgtt cggaaaagtg aatgttcaga 180
tcaagctggt tcctggcgac tctgctggca ccgttactgc tttctatatg tcttcccaag 240
gtgatcaaca tgacgaattc gactttgaat tcttggggaa cacttcagga gaaccgtacg 300
ttgtgcagac gaatgtttat tcaaatgggg ttggcaacag agagcagcgt atttacctgt 360
ggttcgatcc aactgcgaat ttccattcct actcctttct ctggaatcgc caccaatctg 420
ttttctttgt ggacgatgtg cctattcggg tgttttccaa caatgagaaa agaggagtcc 480
catttcctca aacccgccct atgggcgtat actcttcaat atggaacgca gatgactggg 540
ctactca 547

<210> 881
<211> 197
<212> DNA
<213> Pinus radiata

<400> 881
tctctagaca aatggacagg tactggcttc caatccaagg gtacctactt gtttggacac 60
tttagtatgc agataaagat ggttcctggt gactctgcag gcactgtgac tgccttttat 120
ctatcctccc agaatgccga gcacgatgaa atagattttg agttcctggg caataggtct 180
ggacagcctt acattct 197

<210> 882
<211> 622
<212> DNA
<213> Pinus radiata

<400> 882
catcctccta catacattcg tttcactact ctttctttgc acgcgtccat ctcgagctat 60
tctattcctt tcatcccttg cctacactaa tctgcacttg gatctcaaat tcaagttcct 120
ctatttctat taacccataa ttatggacac aggaacgccc ctcctctttc ttttcttatt 180
aataacctcg tcgagtcttc ttgtaattgt ttctgcaaat ttctacaacg atgtcgacat 240
cacatggggc gatggtcgtg gtaagatcct tgacaatggc caacaattac agcttactct 300
gaatcgcact tcaggttctg ggtttcaatc caagaatgag tatctctttg ctaaagttga 360
tatgcaaatc aagttggtac ctgggaactc tgccggcaca gttactgctt attatctgtc 420
gtctcaaggt cccaagcacg acgaaataga ctacgaattt ctaggcaacc tctctggaga 480
tccctatatt atgcacacca atatcttcgc tcaaggcctt ggcaatcgtg aacagcaatt 540
ctacttgtgg ttcgacccaa ccctggcttt tcacacttac tccgtgctct ggacaccaaa 600
tcaaattaca ttgtccgtgg ac 622

<210> 883
<211> 223
<212> DNA
<213> Pinus radiata

<400> 883
gctggtgctc ttggtagctg caatggctgc tatggctgcc tcacctccta agcctgtgga 60
cgtaccattc ccaaaaaatt atgtacccac ttgggctgct gatcatatca agtcatcaat 120
ggtggaaatg aggttcagct ttctctagac aaatggacag gtactggctt ccaatccaag 180
ggtacctact tgtttggaca ctttagtatg cagataaaga tgg 223

<210> 884
<211> 304
<212> DNA
<213> Pinus radiata

<400> 884
gagagcagag gatatacctc tggtttgacc ccacaaaaga ttaccatgcc tactctgtgc 60
tctggaacat gcatcagatc gtattctttg tggacgatgt ccccatcaga gttttcaaga 120
atagcaggga cttatgagtg aggtacccat ttaaccagcc catgaaaata tactcaagcc 180
tgtggaatgc tgatgactgg gccacaaggg gtgggctgga gaagacagat tggagcaaag 240
caccatttgt tgcatcatac aggggattcc acgtggatgg gtgtgaggcc tctgtaactg 300
agtc 304

<210> 885
<211> 367
<212> DNA
<213> Pinus radiata

<400> 885
aaggggtggg ctggagaaga cagattggag caaagcacca tttgttgcat catacagggg 60
attccacgtg gatgggtgtg aggcctctgt aactgagtcg acttgtgcta ctcagggtcg 120
tcggtggtgg gatcaaaagg ccttcgatga ccttgatgga atgcaatgga gaaaactgaa 180
gggggttcgt aacagttaca ccatctataa ctactgcgct gacaaagtga ggtctccagc 240
aatgcctcca gagtgtacca gagaccgtga catttaatag cagcctctta ggggctctta 300
tttatagata tattaatata tcttctgtaa tctattcttc ttagatatgc tttgttattt 360
atgtcat 367

<210> 886
<211> 358
<212> DNA
<213> Pinus radiata

<400> 886
gggccacaag ggtgggctgg gagaagacag attggagcaa agcaccattt gttgcatcat 60
acaggggatt ccacgtggat gggtgtgagg cctctgtaac tgagtcgact tgtgctactc 120
agggtcgtcg gtggtgggat caaaaggcct tcgatgacct tgatggaatg caatggagaa 180
aactgaaggg ggttcgtaac agttacacca tctataacta ctgcgctgac aaagtgaggt 240
ctccagcaat gcctccagag tgtaccagag accgtgacat ttaatagcag cctcttaggg 300
gctcttattt atagatatat taatatatct tctgtaatct attcttctta gatatgct 358

<210> 887
<211> 343
<212> DNA
<213> Pinus radiata

<400> 887
aaggggtggg ctggagaaga cagattggag caaagcacca tttgttgcat catacagggg 60
attccacgtg gatgggtgtg aggcctctgt aactgagtcg acttgtgcta ctcagggtcg 120
tcggtggtgg gatcaaaagg ccttcgatga ccttgatgga atgcaatgga gaaaactgaa 180
gggggttcgt aacagttaca ccatctataa ctactgcgct gacaaagtga ggtctccagc 240
aatgcctcca gagtgtacca gagaccgtga catttaatag cagcctctta ggggctctta 300
tttatagata tattaatata tcttctgtaa tctattcttc tta 343

<210> 888
<211> 517
<212> DNA
<213> Pinus radiata

<400> 888
ctcctacatg tttgagcgat tttactcatt cgtttcatac tctttctttg cacgcgtcca 60
tctcgagcta ttctattcct ctcatccctt gcctacacta atctgcactt ggatctcaaa 120
ttcaagttcc tctatttcta ttaatccatg attatggaca caggaacgcc cctcctcttt 180

ctttcttat taataacctc gtcgagtctt cttgtaattg tttctgcaaa tttctacaac 240
gatgtcgaca tcacatgggg cgatcgtcgt ggtaaaatcc ttgacaatgg ccaacaatta 300
cagcttactc tggatcgcac ttcaggttct gggtttcaat ccaagaatga gtatctcttt 360
gctaaagttg atatgcaaat caagttggta cctgggaact ctgccggcac agttactgct 420
tattatctgt cgtctcaagg tcccaagcac gacgaaatag actacgaatt tctaggcaac 480
ctctctggag atccctatat tatgcacacc aatatct 517

<210> 889
<211> 543
<212> DNA
<213> Pinus radiata

<400> 889
ctcgtgccgc ttcagtttcg ggcgccagta aggtcgttgg aagccatgaa gaggacacag 60
tttcttgttc tgtttctcat tctgttactc cattctgctg ccatggctac cactcccagg 120
aagccagtga gtgtgccctt tcacaacaat tatgtcgcca gctggggctc agatcacatc 180
aaacaattcc atggcggtcg aaagactgag ctgctcctca acaaacagta tggtgcgggg 240
tttgagtcga aggggacata tttatttggg catttcagta tgcagataaa gctggttgcc 300
ggtgattccg ctggcactgt caccgccttt tatctttctt ctcagactgc agagcacgat 360
gagatagact ttgaattctt ggggaacaag tcgggggaac cctacattct tcagaccaat 420
gtatttacgg gcgggaaggg tgagagagag caccgaatat acctctggtt cgaccccacc 480
aaggattacc attcctatgc tgtgctctgg aacatgtacc aaattgcatt tttggtagat 540
gag 543

<210> 890
<211> 234
<212> DNA
<213> Pinus radiata

<400> 890
tacatacaga ttcggatggt ttagcatgaa cctcacgctc gcaccgggac actctgcaag 60
agtggacgat gcttattata tgtcttctaa caccaacatg aatagggacg agctggactt 120
tgagtttctg ggaacagaa gtggagagcc atatgctctg cacacaaaca tctatgcaaa 180
gggtgtgggt ggtagggaac agaggcacat tctctggttc gatccaacga caca 234

<210> 891
<211> 311
<212> DNA
<213> Pinus radiata

<400> 891
tgtttgcaga gatttgttgg ggcaatgctg atcaagatgg tccccaaact gttgctggtg 60
ctcttggtag ctgcaatggc tgctatggct gcctcacctc ctaagcctgt ggacgtacca 120
ttcccaaaaa attatgtacc cacttgggct gctgatcata tcaagtacat caatggtgga 180
aatgaggttc agctttctct agacaaatgg acaggtactg gcttccaatc caagggtacc 240
tacttgtttg gacactttag tatgcagata aagatggttc ctggtgactc tgcaggcact 300
gggactgcct t 311

<210> 892
<211> 377
<212> DNA
<213> Pinus radiata

<400> 892
caacgagagg ctgggagtcc catatcctaa gaaacagccc atgagggtat cctcttcaat 60
ctggaatgca gataactggg ctactcaagg tgggcggctg aagataaact ggagccattc 120
tcctttttatc tccacttaca aaaggttcga catcgatgca aaccaatacg gattaaatgg 180

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : C12N 15/53, 15/54, 15/56, 15/60, 15/61, 9/08, 9/10, 9/12, 9/16, 9/18, 9/26, 9/32, 9/38, 9/40, 9/44, 9/88, 9/90, C07K 14/415, A01H 1/00, 5/00	A3	(11) International Publication Number: WO 00/22092 (43) International Publication Date: 20 April 2000 (20.04.00)

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(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

With international search report.

(88) Date of publication of the international search report: 13 July 2000 (13.07.00)

(54) Title: MATERIALS AND METHODS FOR THE MODIFICATION OF PLANT CELL WALL POLYSACCHARIDES

(57) Abstract

Novel isolated polynucleotides and polypeptides associated with the synthesis of plant cell wall polysaccharides are provided, together with genetic constructs comprising such sequences. Methods for using such constructs for the modulation of polysaccharide content in plants are also disclosed, together with transgenic plants comprising such constructs.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ99/00169

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: C12N 15/53, 15/54, 15/56, 15/60, 15/61, 9/08, 9/10, 9/12, 9/16, 9/18, 9/26, 9/32, 9/38, 9/40, 9/44, 9/88, 9/90; CO7K 14/415; A01H 1/00, 5/00.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
SEE ELECTRONIC DATABASE BOX BELOW.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EMBL, GENBANK, SWISS PROTEINS, PIR as per sequence id nos specified in inventions 1-5 stated on the extra sheets (1) and (2)..

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 137280 A (CETUS CORPORATION) 17 April 1985. See the sequence in table 1 on pages 38-44.	1-5, 18 and 19. (Seq id no 125
X	Sims P F G *et al* "Differential expression of multiple exocellobiohydrolase I-like genes in the lignin-degrading fungus *Phanerochaete chrysosporium*" Mol. Microbiol (1994) **12**(2) 209-216. See figures 2 and 3 on pages 211 and 213.	1-9, 18 and 19. (seq id nos 129 and 130)
X	Genepept acc. no.. AAB37767 (5 December 1996) See the whole abstract.	1-5, 18 and 19. (seq id nos 38, 40-43, 90, 132-134 and 146.)

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

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Date of the actual completion of the international search	Date of mailing of the international search report
11 April 2000	14 APR 2000
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **J.H. CHAN** Telephone No : (02) 6283 2340

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ99/00169

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Genpept acc. No. AAC29067 (7August 1998) See the whole abstract.	1-5, 18 and 19. (seq id nos 39, 132, 136 and 138)
X	Genpept acc. no. AAC39333 (4 February 1998) See the whole abstract.	1-5, 18 and 19. (seq id nos 39, 41, 93 and 137)
X	Genpept acc. no. AAC39336 (6 February 1998) See whole abstract.	1-5, 18 and 19. (seq id nos 37, 38, 41-43, 93 and 146)
X	EMBL acc. no. Z22528 (8 February 1996) See the whole abstract	1-5, 18 and 19. (Seq id nos 120 and 125)
X	Genbank acc. no. AF27173 (7 February 1998) See whole abstract.	1-5, 18 and 19. (seq id nos 10, 12, 122, 123, 126, 128 and 141)
X	Genbank acc. no. AF27174 (7 February 1998) See whole abstract.	1-5, 18 and 19. (seq id nos 1, 12-14, 70, 122, 124, 128 and 141)
X	Genbank acc. no. AF030052 (5 February 1998) See the whole abstract.	1-5, 18 and 19. (seq id nos 12, 67 and 70)
X	Genbank acc. no. AF062485 (8 August 1998) See the whole abstract.	1-5, 18 and 19. (seq id nos 70, 122, 128 and 144)
X	Genbank acc. no. U58283 (5 December 1996) See the whole abstract.	1-5, 18 and 19. (seq id nos 11, 12, 14, 69, 107, 121, 123, 128 and 141)
X	Genbank acc. no. U58284 (5 December 1996) See the whole abstract.	1-5, 18 and 19. (seq id nos 8, 9, 11, 14, 66, 123, 124 and 128)
X Y	WO 94/28146 A (HOECHST SCHERING AGREEVO GmbH) 8 December 1994. See whole document especially sequence id nos 2 and 4.	1-9, 11-13, and 15-19. (seq id nos 2, 15-17, 19, 59-61, 71-76, 139, and 552-554)

INTERNATIONAL SEARCH REPORT

International application No.
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C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5773693 A (Diane G BURGESS and Hugo K DOONER) 30 June 1998. See the whole document,especially sequence id no 5 on columns 41-44.	1-9, 11-13 and 15-19. (seq id no 60)
X	Genpept acc. no.AAB40723 (15 January 1997) See the whole abstract.	1-5, 18 and 19. (seq id nos 32, 87 and 147)
X	Genpept acc. no. AAC49941 (9 March 1998) See the whole abstract.	1-5, 18 and 19. (seq id nos 32 and 38)
X	Genpept acc. no. AAA66057 (10 May 1995) See the whole abstract.	1-5, 18 and 19. (seq id nos 30, 31 and 83-85)
X	Genpept acc. no. AF068260 (11 June 1998) See the whole abstract.	1-5, 18 and 19. (seq id no 65)
X	Swiss-prot acc. no. P55232 (1 October 1996) See the whole abstract.	1-5, 18 and 19. (seq id nos 83, 85 and 87)
X	Swiss-prot acc. no. Q00081 (1 April 1993) See the whole abstract.	1-5, 18 and 19. (seq id nos 32, 88 and 147)
X	Genbank acc. no. U81033 (15 January 1997) See the whole abstract.	1-5, 18 and 19. (seq id nos 3 and 142)
X	Genbank acc. no. U85496 (9 March 1998) See the whole abstract.	1-5, 18 and 19. (seq id no 63)
X	Genbank acc. no. X96765 (13 March 1997) See the whole abstract.	1-5, 18 and 19. (seq id nos 1, 59 and 64)
X Y	WO 96/12814 A (DANISCO A/S) 2 May 1996. See the whole document, especially sequence id no 18	1-9, 11-13 and 15-19. (seq id nos 4-6, 57 and 140)
X Y	US 5316931 A (Jon DONSON *et al*) 31 May 1994. See the whole document, especially sequence id no 5 on columns 49-54.	1-9, 11, 12, 18 and 19. (seq id no 58)

INTERNATIONAL SEARCH REPORT

International Application No.
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C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO 90/12876 A (AKTIESELSKABET DE DANSKE SPRITFABRIKKER) 1 November 1990. See whole document especially figures 2-5.	1-9, 11-13, 15-19. (Seq id nos 34, 35, 81 and 145)
X Y	US 5688684 A (Naoshiro Yoshigi *et al*) 18 November 1997. See the whole document, especially sequence id nos 2 and 3 on columns 9-16.	1-9, 11, 12, 18 and 19. 13 and 15-17 (seq id nos 254, 256, and 260-262)
X	Mori H *et al* "Moklecular cloning of an α- amylase cDNA from germinating cotyledons of kidney bean" J Appl. Glycosience **45**(3) 261-267 (1998) See the whole document, especially the amino acid and nucleotide sequences depicted in figure 3 on page 264.	1-5, 18 and 19. (seq id nos 33, 82 and 145)
X	Genpept acc. no. AAA32935 (27 April 1993) See the whole abstract.	1-5, 18 and 19 (seq id no 34)
X	Swiss-Prot acc. no. P17859 (1 August 1990) See the whole abstract.	1-5, 18 and 19. (seq id nos 33 and 82)
X	Embl acc. no. M92090 (27 April 1993) See the whole abstract.	1-5, 18 and 19. (seq id no 253
X	Embl acc. no. D01022(18 June 1993) See the whole abstract.	1-5, 18 and 19. (seq id nos 252, 254 and 255)
X	Genbank acc. no. Z25871 (6 September 1993) See the whole abstract.	1-5, 18 and 19. (seq id no 261)
X	Genbank acc. no. AJ225087 (25 March 1998) See the whole abstract.	1-5, 18 and 19. (seq id nos 257, 259, 260 and 262)
X	WO 97/32027 A (MAX-PLANCK-GESELLSCHAFT ZUR FORDERUNG DER WISSENSCHAFTEN EV) 4 September 1997. See the whole document, especially sequence id nos 1 and 2 on pages 17-18.	1-10, 11-13 and 15-19. (seq id nos 77 and 78)
X	Hesse H Willmitzer L "Expression analysis of a sucrose synthase gene from sugar beet" Plant Mol. Biol. 30 863-872 (1996) See the whole document, especially the sequences depicted in figure 1 on page 866.	1-10, 11-13 and 15-19. (seq id nos 45, 95-99)

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/NZ99/00169

C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Godt D E et al "Regulation of sucrose synthase expression on chenopodium rubrum characterization of sugar induced expression in photoautotropho suspension cultures and sink specific expression in plants" J Plant Physiol 146 231-238 (1995) See the whole document, especially the sequence depicted in figure 1 on page 234.	1-9, 11-13, 15-19. (seq id no 102)
X	Genbank acc. no. AF030231 (21 January 1998) See the whole abstract.	1-5, 18 and 19. (seq id nos 15, 16, 18, 105 and 139)
X	PIR acc. no. S22535 (3 May 1994) See the whole abstract.	1-5, 18 and 19. (seq id no 148)
X	Swiss-prot acc. no. Q00917 (1 April 1993) See the whole abstract.	1-5, 18 and 19. (seq id nos 45, 46, 95-97 and 100)
X	Swiss-prot acc. no. Q01390 (1 April 1993) See the whole abstract.	1-5, 18 and 19. (seq id nos 44, 48, 100, 106 and 144)
X	Swiss-prot acc. no. P13708 (1 January 1990) See the whole abstract.	1-5, 18 and 19. (seq id nos 44, 46-48, 98-100, 106 and 144)
X	Swiss-prot acc. no. P31926 (1 July 1993) See the whole abstract.	1-5, 18 and 19. (seq id nos 44, 47, 100, 101, 106 and 144)
P, X	WO 98/53085 A (ZENECA LIMITED) 26 November 1998 (Priority date 20 May 1997) See the whole document, especially sequence id no 42 on page 42-43.	1-11, 18 and 19. (seq id nos 20, 21, 79 and 80)
X	Swiss-prot acc. no. P19595 (1 February 1991) See the whole abstract.	1-5, 18 and 19. (seq id nos 49, 50, 51, 103 and 104)
X	Genbank acc. no.Z18924 (4 December 1992) See the whole abstract.; seq id nos 20, 21, 22, 79 and 80.	1-5, 18 and 19. (seq id nos 20-22, 79 and 80)

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Box 1 Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos :

   because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos :

   because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos :

   because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The International Searching Authority has found that there are 34 separate inventions, wherein a single enzyme type or protein provides the special technical feature. This is based on the following reasons:

1) The international application has claimed nucleic acid sequences encoding 33 different enzymes and 1 protein (annexin), the fragments of these genes, their use in transforming plants to modulate the polysaccharides content of

(to be continued on the extra sheets (1)-(5))

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos. 1-19 in the inventions as defined in the following::

   Inventions 1, 2, 3, 4 and 5 as stated on the extra sheets (1) and (2).

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

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Supplemental Box
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No II:

the plant, the probes or primers based on these genes, and polypeptides coded by these genes and their variants with at least 50% homology.

2) Whilst these 908 sequences are from either *Pinus radiata* or *Eucalyptus grandis*, the invention is to these sequences *per se* and their variant which have 50% homology to the former. The invention as described is also to the use of oligonucleotide probes or primers based on these sequences. It is clear that all these nucleic acids sequences are not limited to the source from which they are isolated, as such the source from these plants cannot be the special technical feature under Rule 13.2 of the PCT. (3)

3) The nucleic acid sequences and their putative amino acid sequences have been shown to have similarity to protein or enzymes which are known to be involved in the synthesis of polysaccharides in the cell walls of plants (p 9 lines 20 to page 11 lines 2). Based on this methodology, the 909 sequences in the quoted passage have been assigned with 33 different enzymic activities and the biological activity of the annexin (a non-enzymic protein). However, these enzymes and protein are not unified by sequence homology, by a common substrate or their mode of action (eg as a non-enzyme, a hydrolase or an oxido-reductase etc.). In addition, many of these enzymes are known to have activity inside the cell and not associated directly with the syntheses of cell wall polysaccharides. Furthermore, the use of the sense or antisense constructs coding the enzymes as transgenes in plants are known. Several transgenes (eg based on branching enzyme, sucrose synthase, ADP-glucose pyrophosphorylase, UDP-glucose pyrophosphorylase and 1,3- ß-glucanase) have been used to alter the polysaccharide contents in the plant or plant cells. Therefore, the use of the nucleotide sequences encoding these proteins as transgenes, either in the sense or antisense direction, to affect polysaccharide content or composition in plant is not a special technical feature under Rule 13.2 of the PCT.

For these reasons the international searching authority has identified 34 inventions; they are as listed below:

1. Nucleic and amino acid sequences SEQ ID NOS 7-14, 36-43, 66-70, 90-94, 107, 108, 119-138, 141, 146 and their at least 50% homologues coding cellulose synthase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

2. Nucleic and amino acid sequences SEQ ID NOS 1-3, 30-32, 59-65, 83-89, 142, 147 and their at least 50% homologues coding ADP-glucose pyrophosphorylase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

3. Nucleic and amino acid sequences SEQ ID NOS 4-6, 33-35, 57, 58, 81, 82, 140, 145 and 252-262 and their at least 50% homologues coding amylase, α- or β-amylase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

4. Nucleic and amino acid sequences SEQ ID NOS 15-19, 44-48,71-78, 95-102, 105, 106, 139, 143, 144, 148 and 552-555 and their at least 50% homologues coding sucrose synthase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on

- to be continued on the extra sheet (2) -

Supplemental Box
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No II (continued from extra sheet (1))

these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

5. Nucleic and amino acid sequences SEQ ID NOS 20-23, 49-51, 79, 80, 103, 104 and their at least 50% homologues coding UDP-glucose pyrophosphorylase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

6. Nucleic and amino acid sequences SEQ ID NOS 24-29, 52-56, 109-118 and their at least 50% homologues coding annexin, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

7. Nucleic and amino acid sequences SEQ ID NOS 149-185 and their at least 50% homologues coding 1, 3-β-D-glucanase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the polypeptides in the activities of these biosynthetic pathway using these constructs.

8. Nucleic and amino acid sequences SEQ ID NOS 186 and their at least 50% homologues coding 1,4-β-cellobiohydrolase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

9. Nucleic and amino acid sequences SEQ ID NOS 187-196 and their at least 50% homologues coding α,α-trehalose phosphate synthase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

10. Nucleic and amino acid sequences SEQ ID NOS 197-204 and their at least 50% homologues coding α-glucosidase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

11. Nucleic and amino acid sequences SEQ ID NOS 205-250 and their at least 50% homologues coding aldolase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

- to be continued on the extra sheet (3) -

Supplemental Box
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No II (continued from extra sheet (2)):

12. Nucleic and amino acid sequences SEQ ID NOS 251 and their at least 50% homologues coding amylopectin 6-glucanohydrolase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

13. Nucleic and amino acid sequences SEQ ID NOS 263 and their at least 50% homologues coding P-glucosidase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

14. Nucleic and amino acid sequences SEQ ID NOS 264-272 and their at least 50% homologues coding branching enzyme, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

15. Nucleic and amino acid sequences SEQ ID NOS 273-318 and their at least 50% homologues coding D-fructokinase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides 'in the biosynthetic pathway using these constructs.

16. Nucleic and amino acid sequences SEQ ID NOS 319-354 and their at least 50% homologues coding D-xylulose reductase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

17. Nucleic and amino acid sequences SEQ ID NOS 355-365 and their at least 50% homologues coding endo-1, 3-1,4-p-glucanse, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides 'in the biosynthetic pathway using these constructs.

18. Nucleic and amino acid sequences SEQ ID NOS 366-371 and their at feast 50% homologues coding glucan exo-1, 3-P-glucosidase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypcptides in the biosynthetic pathway using these constructs.

19. Nucleic and amino acid sequences SEQ ID NOS 372-377 and their at least 50% homologues coding glucose 6-phosphate dehydrogenase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs

-to be continued on extra sheet (4)-

Supplemental Box
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No II (continued from extra sheet (3)):

20. Nucleic and amino acid sequences SEQ ID NOS 378-38 land their at least 50% homologues coding glucose phosphate isomerase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

21. Nucleic and amino acid sequences SEQ ID NOS 382-389 and their at least 50% homologues coding isoamylase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

22. Nucleic and amino acid sequences SEQ ID NOS 390-393 and their at least 50% homologues coding L-ribulokinase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

23. NucleicandaminoacidsequencesSEQIDNOS394-398andtheiratleast5O%homologuescoding mannitol-l-phosphate 5-dehydrogenase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides 'in the biosynthetic pathway using these constructs.

24. Nucleic and amino acid sequences SEQ ID NOS 399-478 and their at least 50% homologues coding pectin methyl-esterase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

25. Nucleic and amino acid sequences SEQ ID NOS 479-506 and their at least 50% homologues coding phosphoglucomutase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides 'in the biosynthetic pathway using these constructs.

26. Nucleic and amino acid sequences SEQ ID NOS 507-508 and their at least 50% homologues coding phospho-ribulokinase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the polypeptides in the biosynthetic pathway using these constructs.

27. Nucleic and amino acid sequences SEQ ID NOS 509-521 and their at least 50% homologues coding ribulose-phosphate-3-epimerase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the polypeptides in the biosynthetic pathway using these constructs.

- to be continued on the extra sheet (5) -

Supplemental Box
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No. II (continues from extra sheet (4)):

28. Nucleic and amino acid sequences SEQ ID NOS 522-530 and their at least 50% homologues coding starch phosphorylase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

29. Nucleic and amino acid sequences SEQ ID NOS 531-551 and their at least 50% homologues coding sucrose phosphate synthase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs 30. Nucleic and amino acid sequences SEQ ID NOS 556-586 and their at least 50% homologues coding transketolase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

30. Nucleic and amino acid sequences SEQ ID NOS 556-586 and their at least 50% homologues coding transketolase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

31. Nucleic and amino acid sequences SEQ ID NOS 587-591and their at least 50% homologues coding trehalase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

32. Nucleic and amino acid sequences SEQ ID NOS 592-620 and their at least 50% homologues coding UDP-glucose 4-epimerase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

33. Nucleic and amino acid sequences SEQ ID NOS 621-902 and their at least 50% homologues coding xyloglucan endo transglycosylatse, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides in the biosynthetic pathway using these constructs.

34. Nucleic and amino acid sequences SEQ ID NOS 903-908 and their at least 50% homologues coding xylose isomerase, DNA probes or primers therefrom, composition containing these nucleic acids, their sense or antisense recombinant constructs, transgenic plant/plant cell based on these constructs and a method of modulating the polysaccharide content of plant or the activities of these polypeptides 'in the biosynthetic pathway using these constructs

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/NZ99/00169

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
EP	137280	AU	32530/84	BR	8404346	CA	1338400
		ES	535511	ES	543766	ES	543767
		ES	8602139	ES	8604304	ES	860305
		JP	60149387	JP	7051071		
WO	9428146	DE	4317596	EP	701617	HU	74394
		US	5866790				
US	5773693	US	5498831				
WO	9612814	AU	27881/95	CA	2202896	EP	787194
US	5316931	AU	40725/89	EP	406267	US	5589367
		US	5866785	US	5889190	US	5922602
		US	5529909				
WO	9012876	AU	55318/90	CA	2053230	EP	470145
		US	5498832	US	5789657		
WO	9732027	DE	19607697	EP	883689		
WO	9853085	AU	72257/98				
US	5688684	EP	713916	US	5863784	JP	8089245

END OF ANNEX